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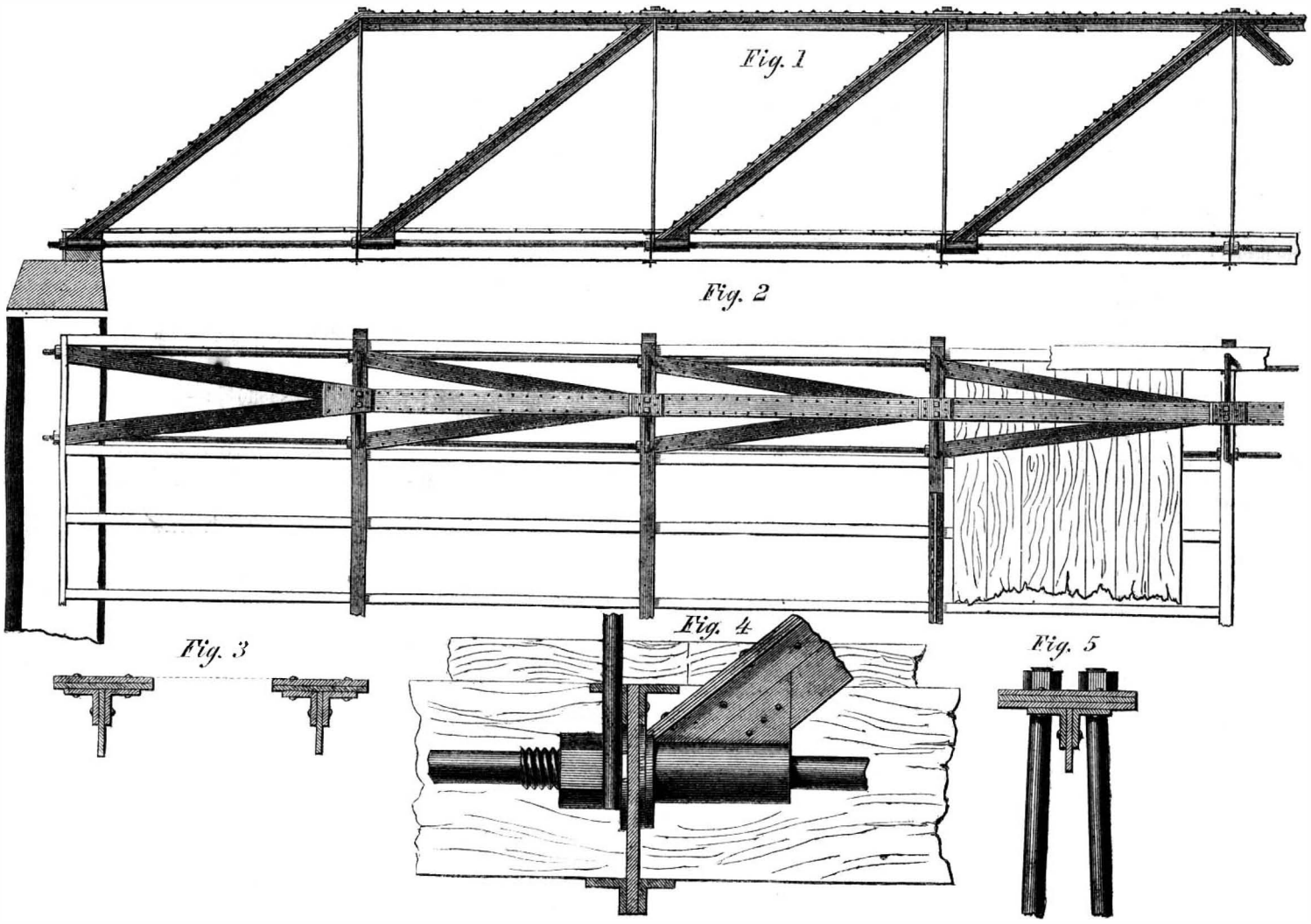
Improved Iron Truss Bridge.

The accompanying diagram illustrates a new mode of employing wrought iron in the construction of trusses for road and farm bridges.

Fig. 1 is a longitudinal elevation of one-half the truss; Fig. 2, a plan of ditto; Fig. 3, a cross section of the double braces; Fig. 4, a cross section of the needle beam at the chords and verticals; Fig. 5, a cross section of the straining beam at the verticals. In this superstructure the straining beam is composed of one vertical and two horizontal wrought-iron plates, secured at their angles by L-pieces, well riveted together with hot button-headed rivets; on the upper side of the beam, at its junction with the outer braces and verticals, extra plates are riveted, as shown in the plan, Fig. 2. All the beams are of the same general figure as the straining beam, the plates being riveted together in the same manner. The braces are arranged in pairs, and diverge from the under side of the straining beam to their common junction with the chords and needle beam; by these means great strength and stability are insured, under the most favorable form of cross section, and all undue vibration of the truss entirely prevented. At the lower end of the braces, and firmly riveted to them, are the thimbles through which the chords pass, as shown in Fig. 4. The chords are also arranged in pairs, and are constructed of round wrought iron. At their junction with the needle beams and verticals, a raised thread is cut upon them to carry the lock nuts that resist the thrust of the braces; the chords may be made of one continuous length throughout, or divided into sections coupled together with turn buckles. The verticals are double, and at their lower ends are finished in the shape of eyes, through which the chords pass; the upper ends of the verticals are secured to the straining beam by nuts screwed down upon it. The cross section of each straining beam, chord, brace and vertical, is proportioned in each panel to the variable amount of compression or extension sustained. Each needle beam is composed of a vertical plate having double-L pieces riveted at its upper and lower edges, in order to form flanges for the support of the floor joists. At the junction of the chords with the needle beams, extra plates are riveted on each side, to insure the perfect rigidity of the beam; the cross section of each beam is proportioned to the area of flooring required. The floor joists, planking and copings are of timber of the usual quality and dimensions.

In this truss are combined all the necessary requirements of a permanent and mechanical structure that may be adapted to any required span or width of roadway. Two of these bridges have already been introduced on the enlarged Erie Canal, by the Hon. William J. Skinner, Commissioner of the Eastern Division. These structures have received the commendation of several of the leading engineers and mechanics of the State.

For further particulars in reference to this superstructure, inquiries may be addressed to the inventor and patentee, George Heath, Contractor of Little Falls, Herkimer county, N. Y., or Clute Brothers, manufacturers of machinery, &c., Schenectady, N. Y.



HEATH'S IRON TRUSS BRIDGE.

A New Line to California---Nicaragua Reopened.

Mr. M. O. Roberts announces the intended reopening of the California route by the way of Nicaragua. The first steamer, a new and splendid vessel named the *America*, will sail on the 25th of October, connecting with the *Moses Taylor* on the other side. Mr. Roberts gives assurance that other vessels will at once be put in service to increase the frequency of the trips; and what is more to the purpose, pledges himself that the line is not put on to be bought off, but that it is to be maintained permanently. The rates of fare, it is stated, will be much lower than those of the actual line, while the time will be shorter.

THE city of Thebes had a hundred gates, and could send out at each gate 10,000 fighting men and 200 chariots—in all 1,000,000 men and 20,000 chariots.

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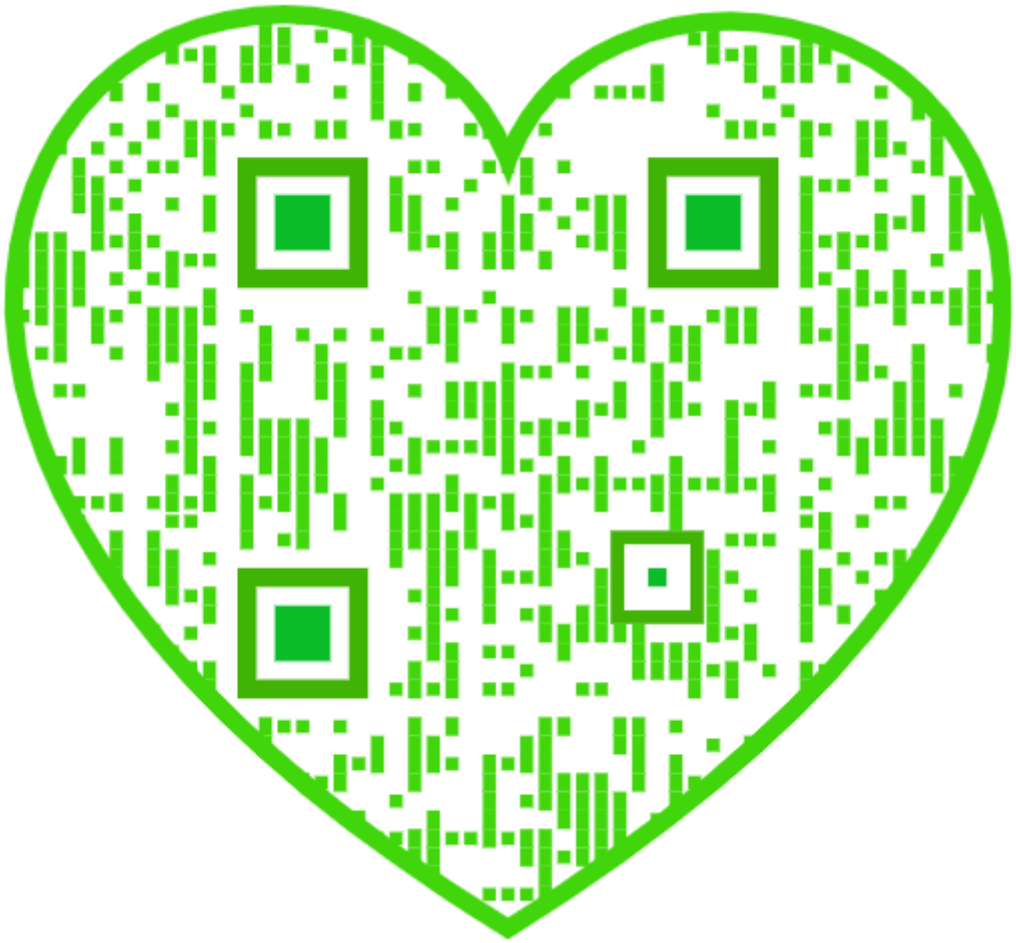

NOTES ON NAVAL AND MILITARY AFFAIRS.

THE BATTLE OF BATON ROUGE.

One of the bravest and most skillfully-fought battles of the war occured on the 5th of August, at Baton Rouge, the capital of Louisiana. This is a town of about 5,000 inhabitants, situated on the east bank—or as the crooked stream here runs, on the southeast bank, of the Mississippi, 129 miles above New Orleans. In the old peaceful days, when our beautiful country was happily united under a most excellent Government, Baton Rouge was the site of a United States arsenal and hospital, and since it was wrested from the temporary occupation of Jefferson Davis's followers, it has been occupied by a detachment of our troops under the command of Gen. Williams, an accomplished West Point officer.

In the latter part of July, the rebel General, Breckinridge, having learned that the troops at that place had become weakened by sickness to a force of about 2,500, determined to attack them with his command, which is estimated by our officers at about 6,000. On the 4th of August a negro brought notice to General Williams that the enemy was advancing, and thus our commander had ample opportunity to dispose his forces for the defence of the place.

Two diverging roads run from Baton Rouge southeastwardly across the flat country, and at a mile from the town these are crossed at right angles by a road running nearly parallel with the river. On the northwesterly side of this road—the side nearest the town—General Williams posted his troops; his lines not only extending the whole distance between the two converging roads but stretching beyond them into the level fields on either side. There were no breastworks, and the only defences of the place were the living bodies of our soldiers who had been enfeebled by a long residence in the enervating climate of the South. Commander W. D. Porter also stationed three of his gunboats in the river above the town and two below, to throw their shells over the heads of our troops into the ranks of the advancing enemy; the firing being directed by signal officer Davis, who stationed himself on the tower of the State House for this purpose.

At half past three o'clock in the morning of the 5th of August our troops took up their assigned positions, and within half an hour afterward the enemy were seen advancing along the two roads, and through a cemetery which lies between them southeast of the cross road.

The 21st Indiana Regiment was considerably beyond our lines, with one company on picket duty in the extreme advance. This company fell back to its regiment, and the regiment then held a whole brigade of the enemy in check for a considerable time. But General Williams ordered them to fall back upon their supports, which they did in admirable order.

The enemy then advanced along the whole line, pouring a destructive fire into our troops from the shelter of the woods, and forcing back our men a few rods, capturing two guns on our right wing, and burning the tents of two regiments, one in the center and one on the left wing. The captured guns were quickly retaken, however, by a brilliant bayonet charge of the Michigan Sixth regiment, and our reserves being ordered up, the attack was repulsed at all points.

During the fiercest part of the engagement General Williams was killed by a rifle shot in the breast. Signal officer, Davis narrowly escaped one of the fragments of a shell which exploded prematurely while passing over the State House.

Our loss is estimated at about 90 killed, and 250 wounded; that of the enemy is stated to be much greater. Breckinridge made a rapid retreat back into the country, and sent a dispatch to the rebel government, claiming a brilliant victory! His sword with his name engraven upon it was found upon the field, and at last accounts he was many miles away.

DESTRUCTION OF THE ARKANSAS.

The following is commander Porter's official report of the destruction of the *Arkansas* :—

U. S. GUNBOAT ESSEX,
Off Baton Rouge, La., Aug. 6, 1862.

Hon. Gideon Welles, Secretary of the Navy :

SIR—On the evening of the 4th inst., I was informed by General Williams, commanding the United States forces at this post, that the enemy in considerable strength, was moving on this place. The rebel ram *Arkansas*, with two gunboats from the Red river—the *Webb* and *Music*—were also in the vicinity of the city to support the attack of the rebel army. I made such a disposition of the naval force under my command as I thought would give the most aid to our small force on shore. On the morning of the 5th inst., at one o'clock, the enemy made an attack on our land forces, and drove in the left wing of our army, killing Gen. Williams. Our men retreating, I opened fire from the *Essex* with shot and shell over them on the advancing enemy, and turned them back with considerable loss. It was doubtless the intention of the enemy to make a simultaneous attack by land and water, but the fire of the *Essex*, driving the rebels back, evidently disconcerted their plans.

Though not making her appearance, I had information of the vicinity of the ram *Arkansas* about four miles above my anchorage on the river, and this morning I determined to steam up the river, attack her and if possible prevent her rendering further assistance to the land forces she was coöperating with. At ten A. M. I came in sight of her at about the distance of half a mile, and immediately opened fire. After an action of about twenty minutes I succeeded in setting her on fire, and at meridian she blew up with a tremendous explosion.

The *Arkansas* had a crew of one hundred and eighty men and mounted ten guns—six eight inch and four fifty pounder rifled cannon. This vessel—the *Essex*—mounts seven guns and had only forty men on duty at the time of our going into action. My First Master, Mr. R. K. Riley, was in the sick hospital, and his place was supplied by Second Master David Porter Rosenmiller, who conducted himself to my entire satisfaction.

I have the honor to be, very respectfully, your obedient servant,
W. D. PORTER.
Commanding Division of Flotilla in Western Waters.

It is stated by two or three correspondents that the *Essex* opened on the *Arkansas* at five hundred yards with three guns loaded with solid shot. One of these took effect right under the port in the starboard bow of the *Arkansas*, and split in two from the force of the concussion. Commander Porter then ordered the same gun to be loaded with an incendiary shell of his own invention, and, without moving the gun to take a new aim, the shell was fired, entering just where the solid shot had struck. Immediately a jet of flame was shooting upward from the *Arkansas*, and in a short time the entire vessel was on fire. After burning till all her upper works were destroyed she swung off into the stream, where she blew up with a terrific explosion.

MOVEMENT OF M'CLELLAN'S ARMY.

On Friday, Aug. 15th, Gen. McClellan's army left its encampment at Harrison's Landing, with the design, it is supposed, of evacuating the peninsular, and of transferring its operations to other points. The stores, with the sick and wounded, were previously shipped on transports, and at nine o'clock on Thursday evening, General Sykes's division commenced its march. Generals Morrell's and McCall's divisions followed, the last of the troops getting away at about three o'clock Friday morning. The first day's march was 12 miles down the James river to the mouth of the Chickahominy, which was crossed on a pontoon bridge, under the protection of gunboats lying in the James river. From this point the route of the army inclined inland across the peninsula to Yorktown, which place was reached by all the divisions on Sunday, Aug. 17th. The further movements of the army were not publicly known at the time of our going to press.

Gold Mining in Calfornia.

We have received from the publisher, John Wiley, 56 Walker street, New York, a little book entitled, Mining in the Pacific States of North America, by John S. Hittell, of San Francisco.

It gives a very full account of the history, mineralogy, chemistry and geology of gold, with a description of the mining region, the mode of prospecting, assaying, placer and quartz minings; the process of silver mining, the laws of mining in California, and several miscellaneous matters pertaining to the subject. It is an excellent work, and must be worth many times its cost to every person going to California. We extract the following account of the New Almaden mercury mine :—

New Almaden is supposed to be—next to the Spanish Almaden—the most valuable quicksilver mine in the world, and perhaps it is even superior to that. The mine is an elevation of 1,000 feet above the sea, and two hundred feet below the top of the hill. Several hundred miners are employed, about half Cornishmen and half Mexican, who are engaged in hunting the ore and taking it out. The deposits of ore have to be hunted; and the miners seek them by following up the little seams. Sometimes these masses are found fifty feet long, twenty wide and twenty high. The ore is hoisted to the surface by machinery, and then is hauled down to the *Hacienda* or Reducing Works, where there are fourteen furnaces of brick. Each furnace may be fifty feet long, twelve feet high and twelve wide. In front is the fire place; next that, is a chamber for the ore, about ten feet cubic, with open walls on each side, so that the heat may enter from the fire, and pass into the condensing chamber behind, in which there are partitions, so that the smoke from the fire and vapor from the ore must pass up and down, alternately, half a dozen times, and finally it rises out of a chimney forty feet high. The ore is placed in the ore-chamber, in large pieces, and with open spaces between, so that the flames and smoke from the fire may pass through it. The earthy matter near the large deposits of cinnabar contains a good deal of metal, and is made into brick, so that they can be piled up, also, with open spaces for the fire to pass through. In the bottom of the condensing chamber is water, by which the fumes of the quicksilver are cooled and condensed. The sulphur of the cinnabar and the smoke of the fire escape through the chimney.

In the Enriqueta and Guadalupe mines, the quicksilver is collected in close iron retorts, which contain quicklime to absorb the sulphur.

The value of the New Almaden mine has been estimated very extravagantly, by the Attorney General of the United States, at $25 000,000; its real value is not more than one-fifth that sum.

The quicksilver is put into wrought iron flasks, made of heavy sheet iron, about a foot long and five inches in diameter, with an iron screw for a cork at one end. Each flask holds seventy-five pounds of metal.

The British Commercial Steam Navy.

Returns have lately been made to the House of Commons of the number, character and tunnage of the steam vessels belonging to England, Scotland and Ireland, from which we learn that in the United Kingdom there are 2,079 steamers, the registered tunnage of which is 494,895 tuns, and the gross tunnage, including boiler room, 758,377. This is an increase of 134 ships and 61,960 tuns, over 1860. They are all classed as follows :—

Wooden paddlewheel	852
Wooden screw	37
Iron paddle	528
Iron screw	655
Iron screw and paddle (Great Eastern)	1
Experimental propeller	1
Steel screw	1
Steel paddle	4
	2,079

Wooden steamers have almost ceased to be built, for of the 134 constructed in 1861, only 29 were of wood. *Mitchell's Steam Shipping Journal* states that the *Adriatic*, the hull of which was built by George Steers, and the machinery by the Novelty Works, this city, was advertised in America as a vessel of 6,000 tuns burden, but having become a British vessel, by purchase, she has been examined and is set down at 3,670 tuns, British measurement. The following comparison is made between her and several English and Scotch built steamers :—

Name.	Length. Ft. In	Breadth. Ft. in.	Hold. Ft. in.	Gross tunnage.	Horse power.
Adriatic, paddle, wood	345 9	50 0	24 1	3,670	1,400
Tasmanian, iron screw	346 0	39 2	20 1	2,253	550
Shannon, iron paddle	330 4	44 5	26 2	3,472	800
Seine, iron paddle	331 6	44 1	33 9	3,440	800
Great Britain, iron screw	274 0	48 2	31 5	3,509	500
City of New York, iron screw	335 5	40 3	18 0	2,360	550
Australasian, iron screw	331 7	42 1	20 9	2,761	700
Persia, iron paddle	376 0	45 3	30 0	3,300	900

Our cotemporary states that the *Adriatic* is described to be "the steadiest ship afloat, and she is not surpassed in speed. Next to the *Great Eastern* she has the greatest breadth of beam of any commercial steamer. Her nominal horse power is very great, and her engine room occupies more than two-thirds of her gross tunnage. The tunnage of the *Persia*, exclusive of engine room, is 2,079 tuns, that of the *Adriatic* only 1,737 tuns. The *Adriatic* has engines of 500-horse power greater than those of the *Persia*, and she is of 370 tuns greater burden, but she has less carrying room to the extent of 342 tuns. She was built chiefly for speed as a mail steamer, and is very expensive to run, but she is a most comfortable vessel for passengers.

THE Portland company in Portland, Maine, have made arrangements for casting guns of large caliber, and have a Government contract for casting fifty 11-inch Dahlgrens.

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CENSUS STATISTICS OF 1860.

[Concluded.]

We this week complete our publication of the census statistics of 1860, by giving the miscellaneous matters not included in any of the classes into which we have divided the subject.

SPIRITUOUS LIQUORS.

The manufacture of spirituous liquors in the United States employed 1,138 distilleries, independent of a large number of rectifying establishments, the product of the former being over eighty-eight millions of gallons of the value of $24,253,176. The Middle and Western States were the largest producers, the latter yielding nearly forty-five and the former thirty-seven millions of gallons of whiskey, high wines and alcohol, the aggregate value in each section being almost eleven millions of dollars. It is satisfactory to observe that more than ninety-five per cent of all the spirits made was from materials of domestic production, a little over four million gallons of New England rum having been the product of imported molasses.

MALT LIQUORS.

The manufacture of malt liquors, though of less magnitude, and far less pernicious in its effects, shows a still larger increase. It derives its material wholly from agriculture, and its extension promises more substantial benefits to the country than the last.

The Northern States returned 969 breweries, or more than double the number in the Union in 1850. The quantity of all kinds of malt liquors made, including 855,803 barrels of lager beer, was 3,235,545 barrels—an increase of 175 per cent upon the total product of 1850, while its value was returned at $17,977,135, being more than three times the amount produced by breweries in that year. Nearly one half of the whole quantity was made in New York and Pennsylvania. The former had 175 establishments—45 of them in the city of New York—and the latter State 172, of which Philadelphia contained 68. The manufacture of lager beer was much increased in all the Middle and Western States, about 41 per cent of the whole being the product of the two States last named. Among the Eastern States, Massachusetts, and among the Western States, Ohio, Illinois and Missouri were the largest producers of malt liquors. There were 71 breweries in California and 8 in Oregon, producing together about 7 per cent of the total value of the manufacture.

SALT.

The making and refining of salt in the United States in 1850 employed 340 establishments, and the value of their production was $2,177,945. The four States of New York, Virginia, Ohio and Pennsylvania, which, in the order named, are the principal salt-producing States, made according to the eighth census, nearly twelve million bushels, the cost of which was $2,200,000, an average of about 18½ cents per bushel. Texas, Kentucky, Massachusetts and California are also self-producing States. About sixty per cent of the whole was made in New York, at an average cost of 17 cents per bushel.

FISHERIES.

In the aggregate product of fisheries there was an increase of 28·5 per cent over their value in 1850. The total value of the lake, river, shore and deep sea fisheries, including oysters to the value of $382,170, and $7,521,588 as the product of the whaling business, amounted in 1860 to $12,924,092. Of this amount $6,526,238 in the whale, and $2,774,204 in the cod, mackerel, halibut and other shore fisheries, belonged to the maritime industry of Massachusetts, and constituted nearly seventy two per cent of the whole. This favorite occupation of her enterprising sons has made Boston, which has been over two and a quarter centuries engaged in the business, the principal distributing fish market of the Union, and has raised the port of Gloucester to the third rank among New England seaports in the amount of its foreign commerce. The latter has become the largest seat of the domestic fisheries in the United States, if not in the world, and distributes the products to all the large cities of the Union and to foreign countries.

The State of Maine holds the second place in respect to the value of its fishing interests, and returned $1,050,755 as the value of the cod, mackerel, herring, &c., taken by its fisherman. North Carolina had the largest shad fishery, amounting in value to $90,768. New Jersey, New York and Virginia took the largest amount of oysters, and Michigan returned the largest value in white fish, amounting to $250,467.

A slight decline in the value of the whale fishery arose from the increasing scarcity of the whale in its former haunts.

CHEMICAL ARTICLES.

Improvements in technical chemistry have added largely to the number and value of its products. The manufacture of articles strictly classed as chemical, exclusive of white lead, ochres, paints, varnish, glue, perfumes, cements, pot and pearl ashes, &c., amounted, in 1850, to the value of nearly five millions of dollars. The production, in 1860, exhibited a considerable increase.

PETROLEUM.

Its existence in any vast amount appears to have been unknown until 1845, when a spring was "struck," while boring for salt, near Tarentum, thirty-five miles above Pittsburgh, on the Alleghany. Experiments having proved its constituents be nearly the same as those of the artificial carbon oil, a company was organized in New York to attempt its purification by the same process applied to the latter. But little was effected, however, and in 1857 Messrs. Bowditch & Drake, of New Haven, commenced operations at Titusville on Oil Creek, where traces of early explorations were found, and in August, 1859, a fountain was reached by boring, at a depth of seventy-one feet, which yielded four hundred gallons daily. Before the close of the year 1860, the number of wells and borings was estimated to be about two thousand, which seventy-four of the larger ones were producing daily, by the aid of pumps, an aggregate of eleven hundred and sixty-five barrels of crude oil, worth, at twenty cents a gallon, about ten thousand dollars. Wells were soon after sunk to the depth of five or six hundred feet, and the flow of petroleum became so profuse that no less than three thousand barrels were obtained in a day from a single well, the less productive ones yielding from fifteen to twenty barrels per diem. In several instances extraordinary means were found necessary to check and control the flow, which is now regulated in such wells, according to the state of the market, by strong tubing and stop cocks. The quantity sent to market by the Sunbury and Erie Railroad from the Pennsylvania oil region, which has thus far been the principal source, increased from 325 barrels in 1859 to 134,927 barrels in 1861. The whole quantity shipped in the last-mentioned year was nearly 500,000 barrels. Since August, 1861, the product has rapidly increased. The present capacity of the wells is estimated at 250,000 to 300,000 barrels per week. So important, however, have the operations in this article become, that a railroad, we understand, has been chartered in Pennsylvania exclusively for the transportation of the oil to market. From a recent number of the *Register*, a newspaper published in Titusville, Pennsylvania, we copy the following statement respecting the production of petroleum in that vicinity:—

"We learn that the number of wells now flowing is seventy-five; the number of wells that formerly pumped and flowed is sixty-two; the number of wells sunk and commenced is 358; total, 495. The amount of oil shipped is set down at 1,000,000 barrels; amount on hand to date, 92,450 barrels; present amount of daily flow, 5,717 barrels. The average value of the oil, at $1 per barrel, is $1,092,000; average cost of wells, at $1,000 each, is $495,000; machinery, building, &c., from $500 to 700 each, $500,000. The total number of refiners is twenty-five. The detailed report of the condition of the wells shows that production is on the increase. Holders are firm at fifty cents per barrel at the wells, and don't seem to care about selling any great amount at that price." With increased facilities for getting it to the seaboard at a cheap rate for transportation, the operations will doubtless become much more extended than at present. The quantity exported from the cities of Philadelphia, New York, Boston, Baltimore and San Francisco, from the 1st of January to the 1st of April, 1862, amounted to 2,342,042 gallons, valued at $633,949. The receipts at Cincinnati, during the same period, of carbon and petroleum oils, were 519,960 gallons, or 13,000 barrels, nearly one-half of which was petroleum oil. The exports from the three cities first mentioned, from the 1st of January to the 16th of May of the present year, were 3,651,130 gallons, worth $889,886, and the shipments in the last week of that period from the same places were 255,600 gallons, valued at $42,160.

A large reduction has taken place in the price since the commencement of the trade, and particularly during the last few months. The price of crude petroleum in Philadelphia on the 4th of January, 1862, was from 22½ to 23 cents a gallon, and of refined oil 37½ to 45 cents. On the 29th of March the prices has declined at the same place to 10 and 12 cents for crude, and 25 to 32 cents for refined oil, while the most recent price current lists place it at 9 and 19 cents. Although the capacity of the existing wells already exceeds a profitable demand, there appears to be no assignable limit to the flow, or to the localities which may be found to yield it, whenever an augmented demand shall warrant farther search or increased production.

BANKS.

If we compare the aggregate features of the banks at each decade with the population and the sum of the imports and exports for corresponding dates, the results are as follows:—

Years.	No. Banks.	Capital.	Loans.	Specie.
1830....	330	$145,192,268	200,451,214	22,114,917
1840....	901	358,442,692	462,896,523	33,105,155
1843....	691	228,861,948	254,544,937	33,505,806
1850....	872	227,469,074	412,607,653	48,677,138
1860....	1,562	421,880,095	691,945,580	83,594,537

Years.	Circulation.	Imports and Exports.	Population.
1830.....	$61,323,898	144,726,428	12,866,020
1840.....	106,968,572	239,227,465	17,069,453
1843.....	58,563,608	149,090,279	
1850.....	155,012,911	330,037,038	23,191,876
1860.....	207,102,477	762,288,550	31,445,080

INSURANCE.

Unfortunately there were no regular statistics collated from year to year, as in the case of banks, by which that interesting index to the growth of the national wealth might be compared. The State of Massachusetts has paid most attention to this matter, and the annual reports are very valuable. The number of companies and amounts at risk have been as follows in that State:—

Year.	No. of Companies.	Capital Stock.	Fire Risks.	Marine Risk.
1840....	41	$7,475,000	51,998,596	50,631,877
1850....	30	6,106,875	63,943,273	76,082,529
1860....	117	6,353,100	348,923,289	101,972,974

The total property at risk has increased in the ten years $310,870,461. Under the present laws of New York the insurance returns are well organized. Taking the figures in connection with those of the leading ones of other States, the results are as follows:—

	Number of Companies.	Capital and Assets.	At Risk.
New York.....	135	$53,287,547	916,474,956
Massachusetts.....	117	6,353,100	450,896,263
Connecticut.....	12	5,364,686	279,322,184
Rhode Island.....	6	2,419,688	32,187,104
Philadelphia.....	10	6,510,601	139,229,374
New Orleans.....	9	6,738,031	221,100,000
Charleston.....	2	——	47,291,000
Augusta, Ga.....	1	952,858	7,000,000
Jersey City.....	1	179,713	5,231,061
Peoria, Ill.....	1	363,995	6,806,377
Total.....	..	....	2,105,538,319

The amount at risk by all companies in the Union may approach three thousand millions, and the losses were reported as follows for 1860:—

Vessels and freights.....	$13,525,000
Cargoes.....	15,050,700
Total marine.....	28,575,700
By fire.....	22,020,000
Total losses.....	$50.595,700

ILLUMINATING OIL FROM COAL

appears to have been made as early as 1846 by Dr. Gesner, of Nova Scotia, and in 1854 the Kerosene Oil Company, on Long Island, commenced the first manufacture of carbo-hydrogen oil under patents secured by Dr. Gesner, using cannel coal from England, New York, and other parts of the United States. The Breckinridge coal oil works on the Ohio, at Cloversport, Kentucky, were commenced in 1856, and were soon followed by others, to the number of twenty-five in operation in 1860 in Ohio alone, with a working capacity of three hundred gallons of light oil each, per diem. There were then about fifty-six factories in the United States, exclusive of some fifteen engaged altogether on petroleum, and several small private coal oil works. The capital expended in coal oil works and cannel coal mines was estimated at nearly four million dollars. The manufacture of coal-oil lamps, resulting from the use of the oil, formed the principal business of sixteen companies, who employed 2,150 men and 400 women and boys, and work for 125 looms in making the lamp wick.

VALUE OF REAL AND PERSONAL ESTATE.

The marshals of the United States were directed to obtain from the records of the States and Territories respectively, an account of the value of real and personal estate as assessed for taxation. Instructions were given these officers to add the proper amount to the assessment, so that the return should represent as well the true or intrinsic value as the inadequate sum generally attached to property for taxable purposes. The result of this return by all the census takers will be found in table No. 34, whereby it will appear that the value of individual property in the States and Territories exceeds the sum of sixteen thousand millions of dollars, representing an increase of one hundred and twenty-six and a half per centum in ten years in value in the aggregate, and an increase of sixty-eight per cent per capita of the free population. The rate of increase has been immense in the Western States, while the absolute gain in the older States has been no less remarkable. For example, the rate of increase in Iowa has been more than nine hundred per cent, while the absolute increase of wealth has been two hundred and forty-seven millions of dollars; while Pennsylvania has increased at the rate of ninety-six per cent, with an absolute gain in wealth of near seven thousand millions of dollars. The wealth per capita for Iowa, in 1850, was $123. while in 1860 it amounted to $366, a rate of increase of one hundred and ninety-seven and a half per cent. The wealth of Pennsylvania, in 1850, per capita, was $312; in 1860, per capita, was $487; the rate of increase fifty-six per cent.

It must be borne in mind that the value of all taxable property was returned, including that of foreigners as well as natives, while all was omitted belonging to the States or United States. In considering the relation of population to wealth the fact must be borne in mind that a much larger proportion of the property of the Western than Eastern States is held by non-residents, and that this circumstance is not without its influence in exaggerating the wealth of individuals in States where large investments have been made by persons resident elsewhere.

The effect of internal improvements upon the prosperity and wealth of the country cannot be better illustrated than by the rapid enhancement in value of all property brought within their influence.

To trace the causes of our great progress in wealth, and to pursue the investigation in detail, would be profitable and interesting, but the want of time makes it incumbent to postpone further review of this table to another time.

Irish Shootings.

The following which we cut from the Dublin *Agricultural Review*, gives us a glimpse of one phase of life in Ireland:—

The eminent gunmakers, W. and T. Kavanagh, of Dame street, have just published their shootings for the present year. The list comprises a large number of tracts of shooting in various parts of Ireland, the letting of which has been confided to the Messrs. Kavanagh. Many Irish landlords who some years since never dreamt that any value was attached to the shooting on their estates, are now receiving incomes averaging from £100 to £500 a year from this source alone. That Irish shootings are rising in the estimation of sportsmen is sufficiently evidenced by the fact that they are each year letting at an improved price, and that they are now eagerly sought after by gentlemen from both England and Scotland. The only thing necessary to enable our Irish moors and mountains to rival in both abundance and variety of game any preserves in the world, was a change in the game laws, rendering more stringent the punishment for poaching. Thanks to the activity of the Earl of Clancarty, a clause was on Monday night introduced into the Game Law Act (No 2), extending its provisions to Ireland, the effect of which will be, if properly applied, to put a complete stop to that system of organized poaching which the existing game laws were not, in many cases, sufficient to cope with.

THE latest explosive powder consists of the flour of starch, boiled with nitric acid. Experiments are now being made with it in Vienna, by Schonbein the discoverer of gun-cotton, with the object in view of using it in the Austrian army.

LET inventors and manufacturers always bear in mind that the SCIENTIFIC AMERICAN is the largest circulated journal of its kind, and is therefore the best known medium for bringing out any new invention, discovery or manufacture.

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ON FORCE—LAWS OF MOTION.

[Concluded from Page 117.]

The sun, by the act of vaporization, lifts mechanically all the moisture of our air. It condenses and falls in the form of rain, it freezes and falls as snow. In this solid form it is piled upon the Alpine hights, and furnishes materials for the glaciers of the Alps. But the sun again interposes, liberates the solidified liquid, and permits it to roll by gravity to the sea. The mechanical force of every river in the world, as it rolls toward the ocean, is drawn from the heat of the sun. No streamlet glides to a lower level without having been first lifted to the elevation from which it springs by the mighty power of the sun. The energy of winds is also due entirely to the sun; but there is still another work which he performs, and his connection with which is not so obvious. Trees and vegetables grow upon the earth, and when burned they give rise to heat, and hence to mechanical energy. Whence is this power derived? You see this oxide of iron, produced by the falling together of the atoms of iron and oxygen; here also is a transparent gas which you cannot now see—carbonic acid gas—which is formed by the falling together of carbon and oxygen. These atoms thus in close union resemble our lead weight while resting on the earth; but I can wind up the weight and prepare it for another fall, and so these atoms can be wound up, separated from each other, and thus enabled to repeat the process of combination. In the building of plants carbonic acid is the material from which the carbon of the plant is derived; and the solar beam is the agent which tears the atoms asunder, setting the oxygen free, and allowing the carbon to aggregate in woody fiber. Let the solar rays fall upon a surface of sand; the sand is heated, and finally radiates away as much heat as it receives; let the same beams fall upon a forest, the quantity of heat given back is less than the forest receives, for the energy of a portion of the sunbeams is invested in building up the trees in the manner indicated. Without the sun the reduction of the carbonic acid cannot be effected, and an amount of sunlight is consumed exactly equivalent to the molecular work done. Thus trees are formed; thus cotton is formed. I ignite this cotton, and it flames; the oxygen again unites with its beloved carbon; but an amount of heat equal to that which you see produced by its combustion was sacrificed by the sun to form that bit of cotton.

But we cannot stop at vegetable life, for this is the source, mediate or immediate, of all animal life. The sun severs the carbon from its oxygen; the animal consumes the vegetable thus formed, and in its arteries a reunion of the severed elements takes place and produces animal heat. Thus, strictly speaking, the process of building a vegetable is one of winding up; the process of building an animal is one of running down. The warmth of our bodies, and every mechanical energy which we exert, trace their lineage directly to the sun. The fight of a pair of pugilists, the motion of an army, or the lifting of his own body up mountain slopes by an Alpine climber, are all cases of mechanical energy drawn from the sun. Not, therefore, in a poetical, but in a purely mechanical sense, are we children of the sun. Without food we should soon oxidize our own bodies. A man weighing 150 lbs. has 64 lbs. of muscle; but these when dried reduce themselves to 15 lbs.. During an ordinary day's work for eighty days, this mass of muscle would be wholly oxidized. Special organs which do more work would be more quickly oxidized; the heat, for example, if entirely unsustained, would be oxidized in about a week. Take the amount of heat due to the direct oxidation of a given amount of food; a less amount of heat is developed by this food in the working animal frame, and the missing quantity is the exact equivalent of the mechanical work which the body accomplishes.

To whom, then, are we indebted for the striking generalizations of this evening's discourse? All that I have laid before you is the work of a man of whom you have scarcely ever heard. All that I have brought before you has been taken from the labors of a German physician, named Mayer. Without external stimulus, and pursuing his profession as town physician in Heilbronn, this man was the first to raise the conception of the interaction of natural forces to clearness in his own mind. And yet he is scarcely ever heard of in scientific lectures, and even to scientific men his merits are but partially known. Led by his own beautiful researches, and quite independent of Mayer, Mr. Joule published his first paper on the "Mechanical Value of Heat," in 1843; but in 1842 Mayer had actually calculated the mechanical equivalent of heat from data which a man of rare originality alone could turn to account. From the velocity of sound in air Mayer determined the mechanical equivalent of heat. In 1845 he published his memoir on "Organic Motion," and applied the mechanical theory of heat in the most fearless and precise manner to vital processes. He also embraced the other natural agents in his chain of conservation. In 1853 Mr. Waterston proposed, independently, the meteoric theory of the sun's heat, and in 1854 Professor William Thomson applied his admirable mathematical powers to the development of the theory; but six years previously the subject had been handled in a masterly manner by Mayer, and all that I have said on this subject has been derived from him. When we consider the circumstances of Mayer's life, and the period at which he wrote, we cannot fail to be struck with astonishment at what he has accomplished. Here was a man of genius working in silence, animated solely by a love of his subject, and arriving at the most important results some time in advance of those whose lives were entirely devoted to Natural Philosophy. It was the accident of bleeding a feverish patient at Java in 1840 that led Mayer to speculate on these subjects. He noticed that the venous blood in the tropics was of a much brighter red than in colder latitudes, and his reasoning on this fact led him into the laboratory of natural forces, where he has worked with such signal ability and success. Well, you will desire to know what has become of this man. His mind gave way; he became insane, and he was sent to a lunatic asylum. In a biographical dictionary of his country it is stated that he died there; but this is incorrect. He recovered, and I believe, is at this moment a cultivator of vineyards in Heilbronn.

Correspondence

The Steam Wagon of the Western Prairies.

The following communication on the subject which formed a leading topic of discussion in the Scientific American of last week, has been received since our remarks were published:—

Messrs. Editors:—I noticed, some time since, an article in your paper in regard to J. A. Reed's Prairie Motor, in which it was stated that it would run from Omaha to Denver City. I also observed, a few weeks ago, a letter from some party in Iowa to the Scientific American, in regard to the impracticability of the route from Omaha City westward for a machine of such size and weight.

Gen. Brown, proprietor of the "steam wagon," arrived here a week or two since, and having obtained all the information in regard to the various routes which could be derived from parties who have been freighting across the plains for several years, he finally determined to run the motor from this point, and it was accordingly landed here. In getting from the levee up into town, they took a circuitous route over a new and rough road, to avoid a bridge, which, it was feared, would not bear the weight of the machine, and ran over a road which would have been impassable for one of the usual-sized Government freight wagons, with six yoke of cattle attached. The steam wagon moved over the road with ease and safety, to the great surprise of two or three hundred of our citizens who witnessed its performance, and many of whom had predicted that it would not work at all.

Gen. Brown and his associates, Messrs. Slote and Osborn, were here several days making their preparations for starting across the plains, and, in the meantime, making several trial trips for the purpose of testing the power and utility of their machine, all of which were entirely satisfactory. On one occasion they took out quite a long train of wagons, carrying not less than one hundred persons, and with this load they moved with ease over a grade of 500 feet per mile. On Tuesday of last week they completed their arrangements and started westward, with about ten tuns of freight; but, unfortunately, after they had gone about twelve miles, having passed safely over all the rough road and got on to the high divide which runs from this point through to New Fort Kearney, they broke a shaft and were unable to proceed farther until they could procure a new one. This accident will detain them here for some time yet. Gen. B. has returned to New York to obtain the necessary machinery, which he will forward immediately. The balance of his party are here yet, and will go ahead as soon as they make the necessary repairs.

Mr. Brown assured the Board of Trade, of this city, that he will have two more motors built and placed on the line from here to Denver by the time the freighting season opens next year; in consideration of which assurance, and the great benefit that it will be to our place, the Board of Trade have agreed to make all necessary repairs on the road as far as New Fort Kearney, so that the grade at no point shall exceed 400 feet per mile.

Fort Kearney is precisely 168 miles from this place, in a line due west, and the road follows the high level divide between the waters of the Platte and Nemaha and Blue rivers. A better natural road I am satisfied cannot be found, and with a little grading at a few places, within ten or twelve miles of this place, it will be as level as some of our western railroads.

Our citizens are quite jubilant over the passage of the Pacific Railroad Bill, in its preseut form, as it almost insures this as the point from which it will start westward.

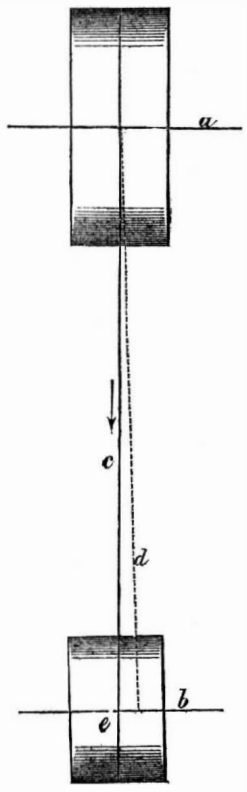
I observed recently a paragraph in several eastern papers, stating that "a conflagration had again visited our city, and that the principal business portion was entirely destroyed." This is a mistake—there has been no fire in our city for the last two years.

Nebraska City, August 2, 1862. A. J. H.

Why a Belt Works from off its Pulleys.

Our correspondent A. B. L. sends us the following explanation in answer to his own question:—

Messrs. Editors:—You ask me to give the cause why a belt works off its pulley when the shafts are not parallel, or diverging in position with each other? I find, when a plain surface (as a stick of timber for instance) moves over a roller of uniform diameter, that every part of that surface moves in straight lines, at right angles with the axis of the roller, no matter what the position of the whole mass may be in reference to that axis. In the inclosed diagram the belt is placed in its proper position on the centers of the pulleys. The belt forms a right angle with the shaft, *a*, but not a right angle with the shaft, *b*, owing to the angle of divergence in the position of the two shafts. Now the belt, following the above law, will move bodily in a line parallel with the dotted line, *d*, at right angles to *b*; one-half of a revolution of the belt will correct the angle at *b*, but will destroy the angle at *a*, consequently the belt will work off both pulleys, toward the ends of the shafts nearest each other. Therefore this rule may be given, that in all cases the belt should run on the pulleys at right angles to the axis of rotation, no matter at with angle it may leave the pulley (as in case of a quarter-twist belt).



I have asked a great many mechanics about this, and the almost invariable answer has been: "The belt runs to the high part of the pulley," practical demonstration being needed to convince them of their

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error. With all deference to our intelligent mechanics, I believe this thing, simple as it is, is yet not generally understood. A. B. L.

Stonington, Conn., July 21, 1861.

THE RAM ARKANSAS.

The following is a private letter received at this office from an officer in the fleet at Vicksburg, dated "U. S. S. *Richmond* (just below Vicksburg), July 18, 1862 :—

I have written you, I believe, full details of our passing above the batteries at Vicksburg and our junction with Davis's fleet. On the morning of the 15th the combined fleets lay at anchor quietly, some five or six miles above the city, and very few of the vessels had steam up. All the lower fleet had let their fires go out and few of the others had steam enough to move instantly. A general feeling of security prevailed, as much as though we were in New York harbor. Yazoo river enters the Mississippi a few miles above where we lay—a narrow stream extending a long way up into the country—and it was supposed to be the retreat of most of the river steamers left in the rebels' hands after the capture of Memphis. An unfinished rebel gunboat and ram, called the *Arkansas*, was supposed to have been towed from Memphis up the river. A few week since a vessel or two of the Ellet ram fleet made a reconnoissance up this river ; but on getting about forty miles up were stopped by a heavy raft of logs protected by batteries. Nothing more was done, not even to place guard boats at the river's mouth. The general impression was that the *Arkansas* was a myth, a failure, or that she drew too much water to get out of the river again at this season. About five days ago a couple of deserters reported that the raft across the Yazoo was removed and that the *Arkansas* was coming down soon. The powers that be did not seem at all alarmed, but on the morning of the 15th, just at daylight, the *Carondelet*, *Tyler* and a ram were sent up the Yazoo to reconnoiter, the rest of the fleet remaining as quiet as before.

The *Carondelet* is the one of Foote's iron-clads that ran by the batteries at Island No. 10. These boats, on account of gross miscalculation, are only partly iron plated, and heavy shot easily reach their steam drums, exposing the crews to a danger far worse than the missiles of the enemy. The *Tyler* is one of the wooden gunboats that did such good service at Pittsburg Landing. Ellet's rams, which first appeared at the engagement at Memphis, are simply fast river boats with their bows strengthened. Their only protection from shot are heavy timbers placed about the boilers and machinery.

Soon after the expedition left, on the morning of the 15th, rapid firing was heard, but little notice was taken of it. It was thought they were shelling the sharpshooters out of the woods. A few minutes before 7 A. M. our ram came down the river at full speed and spread the news that "the ram *Arkansas* was coming." All was bustle. Fires were lighted, and the thick smoke rolled of out the pipes of every boat in the fleet. But just a minute too late. The *Tyler* immediately appeared at full speed coming around the point fighting with her stern guns the ugly-looking *Arkansas* herself, which, without any hesitation, kept right down upon the whole fleet. First, it fired a broadside at the ram fleet, which lay furthest up the river ; the advance gunboat, the *Wissahickon*, receiving two or three shots at about the same time. I thought the *Arkansas* would strike the next gunboat, the *Pinola*, with her iron prow, but she still kept on, evidently intending to ram this ship, the furthest in advance of the large ones. But she still kept on —now evidently bent merely on passing us. She had already received the compliments of the advance gunboats, and a shot from our rifle gun on the forecastle, and as she passed the gunboat in advance of us, the men could be seen in her ports loading her guns. But when she passed this ship, and received of course our broadside, not a man dared come in sight, and we were consequently uninjured. She passed within less than a hundred yards of this ship, and I distinctly saw several of our 9-inch solid shot strike, two of which at least hit her just at the water line ; yet she passed on apparently uninjured.

A short time before this, one of the most venturesome of our ram fleet slipped her anchor and bravely stood out into the stream directly in the path of her iron antagonist. But it was only a sacrifice. A single shot fired at her passed through her boilers and disabled her, and, more sad to relate, we had rëenacted under our very eyes the *Mound City* disaster—scalded men rushing out of the boat into the water. Just after passing this ship the *Arkansas* overtook our ram which she had disabled, drifting helplessly down the stream, and poured into her a full broadside. She soon passed the flag ship *Hartford*, the iron-clad flagship *Benton*, the *Essex*, and, in fact, all the other vessels in the squadron under a tremendous fire at close quarters and yet kept coolly on, turned the point and stopped under the batteries at Vicksburg. The *Benton* and another gunboat went down when they got up steam enough, and exchanged a few shots with the batteries at long range. The rebel, as he passed, fired at will from either of the four sides of his casemated chamber, and it seemed to be his principal aim to destroy our rams—his only objects of dread.

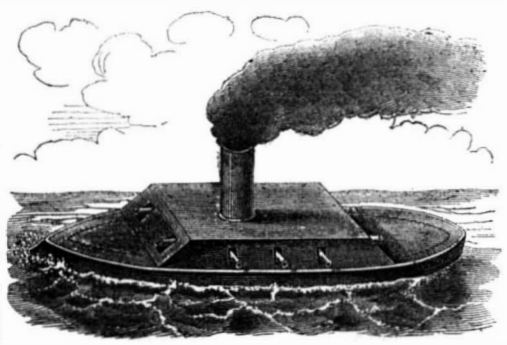
The feat took us completely by surprise, and was as daring as it was successful. It was more dangerous than the exploit of the *Merrimac*, and although perhaps the immediate loss to us in life and property was not quite as great in this case, the movement, in a military point of view, is a very disastrous one. The loss of life was greatest on the boats that were first attacked. The *Carondelet* was raked fore-and-aft with the rebel shots, and lost nine killed and a large number wounded. The *Tyler* fared still worse, as while she retired she made a stubborn resistance to her mailed antagonist.

To give you some idea of what a gauntlet the *Arkansas* ran, I will state that she was exposed to the fire of sixteen vessels, two of them, the *Hartford* and *Richmond*, heavy ships—the former having 20 nine-inch guns and 2 heavy rifles, and the latter 24 nine-inch guns and similar rifles ; two sloops of war—the *Iroquois* and *Oneida*, and four gunboats belonging to the same squadron, beside Davis's fleet of five iron-clad boats, two gunboat rams captured at Memphis, and the wooden gunboat. If we had had steam up we could have rammed the thing, run her ashore or captured her in some way.

Soon after the ram passed all the vessels were ready for action ! Just at dark that evening the whole fleet moved down and attacked the batteries, Farrigut's portion running by to its first position. The fire from the batteries was not as severe as when we went up. The attacking force was larger, which divided the fire more, and we came down of course much faster than we went up. Fortunately no one was injured on board this ship, though the others suffered as much as when we went up. The ram gunboat *Sumter* (captured at Memphis and belonging to Davis's squadron) accompanied us to practice on the *Arkansas* as we passed her, but the darkness and smoke prevented her being seen, as she lay close into the bluff under the batteries.

We are now anchored below the city in range of the lower batteries and anxiously awaiting further movements. The *Arkansas* is in plain view smoking and blowing off steam under the heaviest battery.

From what I can judge of the *Arkansas* from seeing



her pass so close to us, and from what I can learn from the pilots who saw her in Memphis before she was completed, I have made the inclosed rough sketch of her, and can describe her as follows ;—

The *Arkansas* was built at Memphis, and after receiving a portion of her machinery and armor, was, some time before that place was captured, towed up the Yazoo river, where she was recently completed She is about 175 feet long, 32 feet beam, and draws about 12 feet of water. Her hull, below water, is shaped much like that of a sea-going steamer ; she is propelled by two screws, one under each quarter. A single high-pressure engine is connected with each of the propellers. She has six of the ordinary 42-inch river boilers (which easily sustain a pressure of 180 lbs. to the square inch). Her boilers and machinery are entirely under water ; she has but one smoke-pipe, a huge affair, passing up nearly in the middle of the vessel. The bow and stern are but little out of the water, and the former is built of solid timber for some distance aft. Amidships is a low casemated chamber with two portholes at each end and three on each side. Her armor consists chiefly of railroad iron backed by timber, like the *Merrimac*. She has no pilot house ; her wheel is in the casemate chamber, which is furnished with a numbar of "peep holes" for the pilots. She carries ten guns, most of which are supposed to be thirty-twos, though we found when she passed us, that she had several very heavy rifled guns, and at least one 8-inch gun. Deserters who reached the flagship reported that the *Arkansas* lost five men, one of them her pilot, while passing the fleet, by shot which entered her ports. They say, too, that when we passed the city on the night of the 15th, an 11-inch shell (supposed to have been fired by the *Iroquois*) penetrated her casemate, and bursting on deck killed five men and wounded her commander. They also report the extravagant story that the *Star of the West*, now in Yazoo river, and the *Arkansas*, mean to run by the fleets in the river here and at New Orleans, then go to sea and put into Mobile. I verily hope they will try to do so. I fear the *Star of the West* will not get out of the Yazoo, much less run by the fleets with her two exposed beam engines. I hope, ere long, to see the flickering star of rebellion set in the West, never to rise again.

July 19, 1862.

Some officers, who have been taking a look at the ram, from the bushes on the point opposite, report that they can count eighteen places where shot have struck her, some of which are jagged holes through into the casemate chamber. It does not appear, however, that her machinery can be reached so as to disable her. The loss of a few men at her guns does not necessarily cripple her.

Does the Mississippi Flow up Hill?

Messrs. Editors :—At a late meeting of the Teacher's Association of the town of Johnstown, an opinion was delivered by one of the savans maintaining the affirmative of the above proposition, and embracing the following points :—

First, the terms up and down are used in relation to the distance of places from the center of the earth. Second, the earth being an oblate spheroid, any point north or south of the equator is nearer the center of the earth than any place on the equator. Third, the head of the Mississippi river (Lake Itasca) is situated some 2,000 miles north of its mouth. Therefore, as a conclusion deduced from the first two propositions, the river must in its course flow up hill, and that too a number of miles. The reason assigned for this apparent anomaly is the motion of the earth on its axis, and a consequent continual tendency of matter to flow from the poles to the equator.

On being asked why the course of the St. Lawrence is not similarly affected, the reply was, "Because the banks of that stream held the water in." Will the editor of the Scientific American please oblige the readers of his valuable paper in this locality by giving his opinion upon this subject? A. B.

[This is a mere dispute about the meaning of words. Up and down are not ordinarily used to express the distance of bodies from the center of the earth, but their relative distance above or below the level of the sea. The level of the sea is determined mainly by the balance between the centrifugal force resulting from the earth's rotation, and the power of the earth's gravitation. These two forces give the earth its form of an oblate spheroid, causing the surface at the equator to be 13 miles farther from the center than the surface at the poles. When water is raised above this surface the balance of the centrifugal force and gravity causes it to descend to the surface. Though the Mississippi at its mouth is some miles farther from the center of the earth than at its source, it does not flow up hill. Still, if any one chooses to say that it does, the assertion raises a question for lexicographers only ; there is no difference of opinion in relation to the facts Eds.

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The Formation of the Whirlpool.

MESSRS. EDITORS :—Many of your readers have profited by numerous explanations called out by your publication of questions relating to mechanical subjects. I would like to read the various causes that would be assigned for the following well known mechanical experiment. Take a vessel of any size or form, as a common pail, attach a short piece of tube to the center of the bottom, fill the pail with water, and when it has become perfectly quiet, allow the water to discharge through the tube; soon the water in the pail will commence whirling above the tube, and air will be drawn downward through the water and tube, causing a sound as if drawn by considerable force. What causes the whirling of the water, and the passage of air downward through the water and tube? Will the water always whirl in the same direction in the vessel under like circumstances?

R. F. STEVENS.

New York City, August 12, 1862.

Rotary Pumps—Fast and Loose Pulleys.

MESSRS. EDITORS :—There seems to be a general complaint that the various rotary fire engine pumps do not throw so solid a stream or do so good execution, under the same pressure, as the piston pumps. Is the objection well founded? What is the philosophy of the difference?

I find it a great advantage to turn the loose pulley somewhat less in diameter than the fast pulley, thus allowing the belt to contract while on the loose pulley and causing it to run tight on the fast pulley.

Ottawa, C. W., August 4, 1862.

[We were not aware that the rotary fire engine pumps were, as a rule, less effective than the reciprocating ones. If they are we can only account for it by supposing that it is because their packing does not work water-tight.—EDS.

On the Preservation of Meats.

The following interesting information is from *Cosmos*, by M. Martin De Lignac :—

"In the usual way of salting, the meat is placed first in salt, and afterward in pickle. The salt absorbs the liquids in proportion as they separate from the flesh, then the pickle penetrates by endosmose, and preserves them from any subsequent alteration by its antiseptic properties. But in this case the salt acts on the surface a long time before it penetrates to the center, whence results an excess of salt at the surface, whilst the center is not sufficiently salted, and still contains the principles of fermentation. To avoid this the habit is to cut up the meat; but this, while it increases the chances of its preservation, greatly alters its quality. In fact, the salt in contact with large surfaces, absorbs too largely the liquids contained in the flesh, and extracts from them the aroma and a portion of their nutritive juices. Pork, the tissue of which is dense and protected by fat, bears this preparation better than beef, the flesh of which, after long standing in the salt, presents only a fibrous tissue without flavor, and with but a low nutritive power.

It results from these facts :—First, that meat preserved by the usual process contains necessarily too much salt, and that its prolonged use is injurious to health; secondly, that it loses a part—sometimes a notable part—of its nutritive value.

The method of avoiding these inconveniences is to salt uniformly and not subdivide too far the meat, thus preserving its aroma and its juices. I think that I have found the solution of this problem, and the following are the means which I employ :—

If it is a ham which I wish to salt, I introduce, by means of a trocar, between the bone and the muscle at the small end, a sound which I attach to a stop cock, which communicates by a tube with a reservoir of water saturated with salt, to which are added various aromatics and condiments. The reservoir is from 25 to 35 feet high. When the stop cock is opened, the liquid by its pressure rapidly separates the muscle, and the two or three ounces of pickle which are necessary for the preparation of one pound of meat are easily lodged in the cellular tissue which surrounds the bone. Thence it forms a kind of reservoir, the liquid spreads, penetrating all the fibers by infiltration, distributing regularly and homogeneously the conservative agent, and producing its first effect upon the part most susceptible of alteration, that which surrounds the bone. The hams thus prepared are put for some days in a pickle bath. The object of this bath is to prevent by its pressure the issue of the liquid injected, beside which it completes the preparation by saturating the surface. When they leave the bath the meat has lost nothing of the weight which it had at its entrance. I then expose them to a current of air at a moderate temperature. When by evaporation they have lost the infiltrated liquid and 5 per cent of their normal weight, I expose them to the action of smoke for a time which varies with their weight. This latter operation is not necessary for their preservation, but it gives them a taste which is generally sought for, and effects a reduction of weight. On leaving the smoke house they have lost from 12 to 15 per cent of their weight; before entering they had already lost about 5 per cent, so that their whole loss is from 18 to 20 per cent.

JOHN SCOTT RUSSELL ON IRON-CLAD SHIPS.

At a meeting of the Royal Institution of Great Britain on the 16th of May, John Scott Russell delivered an address on "The Iron Walls of Old England," of which we find the following abstract in the *Mechanics' Magazine.*

IRON SHIPS IN GENERAL FAVOR.

It was not the first time the speaker had been allowed the honor of expounding such truths as had been the object of his special study, but he had never treated on one of so great national importance. He was somewhat rash, perhaps, in accepting from the managers the title of this address—rash because the subject was then in a state of transition. It was even worse now, for it had come to what geologists had called a "slip;" he might almost say he found himself at "fault." What he had to say now was as different as possible from what he should have said when he made the promise. Six or eight months ago he should have met here a formidable phalanx of adversaries—amongst them nearly all the naval officers—arrayed against him as the advocate of iron ships of war, and he should have had to argue every point as he proceeded. But unfortunately now we were all on one side; the pugilistic encounter which might then have entertained his audience could not come off. Twelve months ago he had written a pamphlet showing that the end of wooden men of war was at hand, and that it was a sin and a shame to send our sailors to sea in them; but the authorities of that day brought their guns to bear upon him and completely demolished him. Since then, however, he had got up again; and his heterodoxy had become orthodoxy, and he thought there would be no opponent of "iron walls" for the future.

RUSSELL'S OPINION OF AMERICANS.

About the beginning of the present year we were on the eve of war with a people who, whatever their faults, never hesitated to adopt for war the fittest weapons—who, long before rifles were introduced into our army, were celebrated for their use of them and for their manufacture—to whom we are indebted for the revolvers we found so useful in India, and which, whether they invented them or not, they brought to perfection. That people excelled also in ships; for while the English people, priding themselves on the beautiful "wave lines" on which their fast steamers were built, were slow to perceive the advantage of the same lines for their sailing ships; the Americans adopted them for their sailing vessels and came over and beat our fleetest yachts in our waters. It was the Americans, too, who first built ships of large size, and carried off our best freights in their large wave-line clippers. When going to war with such a powerful nation it became necessary to take stock of our fighting material. The Government did take stock of our fleet; and the extent of our navy, fit for a naval battle, at the beginning of the present year—as announced in a powerful leader in the *Times*—was one ship of the line. At the present moment we have two ships of the line fit for service, the *Warrior* and the *Black Prince*, and no more. This serious point is no longer a matter of speculation. It is now universally accepted as a fact—and accepted by us on a very small naval engagement in American waters, the contest of the *Merrimac* and *Monitor*—that an iron vessel of war is better than a wooden one; while the battle of the *Merrimac* with the *Congress* and *Cumberland* has settled the point of dispute eight or nine months ago, viz., that a wooden vessel could not sustain the attack of a ship of war in iron armor. Sir John Hay, the chairman of the naval commission, is quoted in an excellent article in the *Quarterly Review*, as using this expression—"The man who goes into action in a wooden vessel is a fool, and the man who sends him there is a villain."

THE GREAT REVOLUTION OF SHELL GUNS.

Let us now inquire how this revolution has come about. How is it that our brave sailors ought no longer to face our enemies from behind our wooden walls? The revolution has been chiefly brought about by the introduction in artillery of horizontal shell firing. A certain General Paixhans, a Frenchman, contributed more than any one else to this result. He made cannon of eight or ten inches bore, by which explosive shells—which previously had been fired up in the air and had come down again upon their object—could then be fired straight at the mark, especially at a wooden ship, which was as good a target as an enemy could possibly desire. This horizontal firing was for a long while a favorite idea with artillerists; but they had very little opportunity of trying it in practical war. Sir Howard Douglas, speaking of its effects, says, "A shell exploding between decks acts in every direction; under the deck it would blow up all above it; on deck it would make a prodigious breach below it, at the same time that it would act laterally." The shell which accidentally exploded on board the *Medea*, on the lower deck, killed the bombardier and several of the crew, knocked down all the bulkheads, and threw the whole squadron into consternation; and the like effects was to be expected from an enemy's shell lodged before its explosion had taken place. The first experiment on a large scale in actual war was at the commencement of the Russian war. The Russian fleet, sneaking about the Black Sea, put into Sinope, and in a very short space of one morning sank and burnt the Turkish squadron. This battle was the entire effect of horizontal shell firing. The true nature of this horizontal fire has had another illustration.

WHY CRONSTADT WAS NOT TAKEN.

You were all astonished, and wanted to know why Sir Charles Napier did not take Cronstadt, and that our other fleet did not take Sebastopol. It was well known to professional men then why we did not, and there is now no reason why the secret should be kept. Our enemies know it, so why not our friends? Our sailors were not fools enough to stand to their guns in wooden ships exposed to horizontal shell firing. The speaker had read a letter from Lord Dundonald, one of the bravest sailors that ever trod the deck, written by him to Napier off Cronstadt, in which he expresses the greatest apprehension that Sir Charles would be goaded on to try the attack with what he called combustible ships. We tried Sebastopol—or rather we tried to "make believe." We drew up our fleet a great way off, and one or two brave sailors did go in closer. But the Russian gunners were trained to horizontal shell firing, and they soon found out it was best to be further off. The admiral was to be considered the wisest man on board the fleet, for he anchored his ship the farthest off. Those ships that ventured in were rendered by these shells incapable of continuing the action, and it is not now considered a disgrace to those sailors to say that after three shells had exploded in one ship it was not possible to find men "fools" enough to stand to the guns. Now, you know why we did not take Cronstadt; and why you did not know it sooner, was because the Government did not wish you should fail to believe in the wooden walls. At last, however, the *Monitor* and *Merrimac* have let out the secret, and I am here to tell you the whole truth. It need not be said that those shells at Sinope and Sebastopol were not the perfect weapons we have now—the Armstrong shells are much more precise, and will scatter greater destruction around them. How much more I may not tell.

PROTECTION AGAINST SHELL GUNS.

Attention has, therefore, since 1854 till now, been strongly directed to inventions for protecting ships from the effect of shells—and shot also, but chiefly shells. Men will stand against shot, but not against shells; they will run the risk of being hit, but will not face the certainty of being blown up. The inven-

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tion of iron armor took place fifty or sixty years ago.

MR. STEVENS THE PIONEER.

He was not prepared to name the first inventor; but long before we thought of using it in our navy, Mr. R. L. Stevens, a celebrated engineer, of New York, the builder of some of the fastest steam vessels on the Hudson, was, he thought, the inventor. Certainly Mr. Stevens, between 1845 and 1850, gave him a full account of experiments made in America, partly at his own and partly at the State's expense, and found that six inches thickness of iron-plate armor was sufficient to resist every shot and shell of that day. In 1845, he (Mr. Stevens) proposed to the American Government to construct an iron-plated ship, and in 1854 the ship was begun. The ship is in progress, but not yet finished. Mr. Stevens is therefore the inventor of iron armor; but no doubt the first man who applied it practically for warfare was the Emperor of the French. In 1854 he engaged in the Russian war, and being a great artillerist, he felt deeply what his fleet could not do in the Black Sea, and we could not do in the Baltic, and so he put his wise head to work to find out what could be done. In 1854 the Emperor built some floating batteries—four or five; we simply took his design, and made five or six.

WHAT THE ENGLISH HAVE DONE.

He had called the introduction of iron-armor ships, Stevens's and the Emperor's; but something he laid claim to for ourselves. Stevens used thin flat plates one over the other; but Mr. Lloyd, of the Admiralty, being consulted at that time, did express his opinion that solid 4½-inch plates would be more effectual than the six inches of thickness in a congeries of plates. Mr. Lloyd has some of the merit as well as the Emperor for the adoption of this kind of armor. The speaker exhibited a model of the first iron batteries. The form, he said, was not very handsome; in short they were not only not good sea boats, but in a sea good for nothing. They did, however, in smooth water, some good work; at least three of the French Emperor's did. We never got so far. They went to the Black Sea—to Kinburn; and when they came back they were covered with the marks of shot, but not one of them was seriously damaged.

THE EMPEROR NAPOLEON'S DECISION.

This proved the value of these coated vessels, and so convinced the Emperor, that he wisely determined the fleet of France in future should be an iron fleet. We all know with what decision, what success, what economy he has carried that idea out. "I have here," said the speaker, "the means of showing you what this armor is.

THE WAY AN IRON PLATE OPERATES.

Now to tell the secret of the efficacy of an armor plate. First, as a matter of fact, it stops the shot, as an anvil stops a hammar, and stops it outside the ship; and so, therefore, the armor acts practically as an anvil. When these plates were made they were made to resist 8-pounders, and 4½ inches thickness was ample; but now they were firing shot very much larger. When a round ball, or a round shell strikes the iron plate, the first thing done is, that it stops the bit of the ball that first touches the armor; next, the bits round it rush on until they too, get stopped by the armor; and so this little (!) ball makes a dent for itself; the remainder of the crushed ball seems, as Mr. Faraday says, to be "squermed" out of shape. I stole the word, it is so capitally expressive. The shape is not like the original ball—it is an entirely new form altogether. I call it "Faraday's squerm." But we have not the full weight of mettle here. We have only a part of the shot left, the remainder is dispersed in numerous fragments. This is all that remains—a beautiful, smooth, polished cone; the rest has gone everywhere. What meanwhile has happened to the armor? The plate first gets a dent; if Sir William Armstrong hits it twice in the same place the dent gets deeper; and if he hits it again in the same hollow, as he so maliciously does, the dent parts company with the plate and starts on a voyage of exploration for itself. But if this ball (150-pounder) were used, I am sure that at the first hit it would take a piece of its own size away with it. Now, if this occurs with a solid shot, what would happen with a hollow ball made to explode, and fired at the ship? Fortunately, we know what would happen. We have seen it fired, and it not only got smashed to pieces, but it forgot to explode, and the only excuse that can be made for this is that it had not time to do so. I do not know if you know what takes place inside of a gun; but artillerists know it takes some 4 or 5-1000ths of a second for the explosion to go from one end of the charge to the other. Explosion in a shell also takes time, and what happens with the shell striking the armor is that it gets shattered to pieces and the powder scattered about before it has time to explode; and this not only with four-inch iron, but with plates a great deal thinner." This power of annihilating shell is one of the advantages which iron bestows on a ship, and for which wood is powerless; and upon this very fortunate fact the new principle of naval construction is based, for whatever armor will do against shot, it will infallibly keep out the shell. What kind of armor is best against shell and what against shot is still a subject of discussion. The most important results were being worked out by the committee on iron plates as to the best adaptation of armor for the purposes we want.

THE WARRIOR THE BEST KIND OF SHIP.

To the speaker's mind, the best kind of armor and the best kind of ship was that combined in the *Warrior*. There was one gun deck, in which a battery of guns of the heaviest caliber was placed and that battery was entirely covered with iron plates backed with eighteen inches of wood lying between them and the iron skin of the ship. A great effort was now being made to get rid of this wooden backing, which was liable to rot and contributed no strength to the vessel. When an effective iron backing was constructed, the last improvement would be got that was looked for in the construction of an armor-plated ship. He then explained what were the great difficulties to contend with in the construction of the new fleet.

THE GREAT DIFFICULTY WITH ARMOR-PLATED SHIPS.

There was no difficulty in the armor; we know we can keep out the shell and the shot; for if Sir William Armstrong pushes us too hard, we know how much more iron will keep him out. What we have to do that is difficult, is to build a ship that will not merely keep out shell and resist shot, but also possess speed with good sea-going qualities—a monstrous difficulty. The problem was purely one of naval architecture. The difficulty arose in this way: the iron armor placed a very great weight in a very bad place; it tended to make the ship top heavy and "crank." Now, such a vessel rolls, and a very heavy roll might roll her upside under—an event to be avoided as long as possible. The puzzle was, therefore, to make a stable ship that should stand under this great top-weight of armor, and be a good sea-going vessel. The first iron batteries were totally devoid of this quality. They were not "ship-shape," but "sea-chest" shape. Those we sent out to the Black Sea—and one was under a very good captain—never got there, or, if they did, they never did anything but come back again. He referred to them because they were a class of ships that were now being agitated for. The question was now being entertained, in the highest quarters, as to whether our new fleet of vessels should be fit for long voyages and able to encounter heavy seas, such as were necessary for the protection of our colonies and commerce; or whether they should be made unseaworthy slow vessels, incapable of following the enemy if he ran away, still less of catching him. They were only adapted for staying at home; and in order to hurt the enemy, the enemy must come to them to be hurt.

MR. RUSSELL'S PLAN FOR A WAR SHIP.

Mr. Scott Russell then went into the details of what he advocated as the best class of shot-proof vessel—the improved *Warrior* class. This class was 58 feet wide, 400 feet long, and more than 7,000 tuns in size, and cost, fully armed and fitted for sea, not much short of half a million. The distinguishing quality of the *Warrior* was, that she had proved a very excellent sea-going vessel. He was happy to say that four more of this class were building, and two already built. Her armor consisted of 4½-inch iron plates, and extended over the whole length to be protected, and came down about 5 feet below water. This arrangement of armor was such, that its center of gravity should be near the water line, and this was therefore a problem of some difficulty; but the ship had turned out, nevertheless, a faster man-of-war than any other, and also an easy, good sea boat.

THE STEVENS BATTERY.

This difficulty of top weight was got over, in Stevens's early armor vessel, by a different method from the *Warrior*. Giving up the problem of a sea-going ship, he took to smooth water, and built his vessel much on the mid-ship section of a London barge; the sides sloped outward under water, and sloped inward above water, so as to form a narrow upper deck, carrying seven guns, the angles of the sides being usually a little above water, but capable of being sunk to the level of it during action. So little, however, was she adapted for a sea-going ship, that a false side was obliged to be put up to make her at all seaworthy; and he would only ask our naval officers if such vessels were fit to protect our trade and our possessions on the wide ocean? The Stevens battery is as long as the *Warrior*, is to have as high a speed, and carry a central, shot-proof platform, with seven large guns mounted on turn tables, and worked below decks by machinery. The guns were pointed downward for loading, and were returned to their positions, and worked thus by men and machinery below the iron deck, and wholly under cover. There were points in this battery so like some recently proposed to be constructed in this country, that it was difficult to conceive that the secret had not transpired. This battery was begun in 1854 and is now about to be finished. The Stevens battery is a favorable specimen of a ship built for action in the smooth waters of America. But it is our duty to construct quite a different class of ships, and the *Warrior* is the type of that class. No one can help seeing the superiority, for our uses, of having such vessels only as can go anywhere and do anything, and are faster, more powerful, more enduring, and more seaworthy than any other steamships of any other navy.

THE WAY THE MERRIMAC WAS PLATED.

The *Merrimac*, one of the most beautiful of the American frigates, that first set the pattern which has been followed in so many of our own noble vessels, was cut down by the Southerners, and said to have been covered with rails; but, in reality, covered with one coating of plates, six inches broad, and an inch and a half thick, laid diagonally, and a second coating two inches and a half thick, in an opposite direction, over a backing of wood. By this simple means she was converted into the formidable vessel that attacked so victoriously the *Congress* and *Cumberland*, and disabling them by the shells poured in, as much as by her power as a ram, destroyed them in a short encounter. The *Monitor*, improvised by Ericsson in three months, is 160 feet long, 40 wide, and 6 feet deep, and below this upper body is another, propelled by steam. She carries a revolving iron tower, of six inches thick, containing two heavy guns. Now, the upshot of the contest of these two vessels has decided two points for us. 1. That wooden men-of-war are worthless in presence of iron-coated ships; for the *Merrimac* sank two of them without the slightest difficulty. 2. That wooden ships, even coated with iron, are ineffective against iron ships coated with iron armor; for after a long contest, the *Merrimac* failed to injure the *Monitor*, and had to retire.

CAPT. COLES'S SHIELD VESSEL.

Captain Coles's shield vessel was next described. His plans were submitted to the Admiralty in 1859, long prior to the construction of Ericsson's battery. These shields and the *Monitor's* are much alike in principle; but Captain Coles's vessel is a far better sea boat than the *Monitor*, and carries twelve guns instead of one, as in that vessel. Coles's shield has a conical roof, and carries one or two Armstrong 100-pounders fixed in slides, which are parts of the interior of the shield, that moves round on a central pivot, and the men working the guns are turned round in it entirely under cover. The construction of the shield ship designed by the Admiralty is altogether better than the *Monitor's*. The speaker does not wish, however, to see our war ships replaced by vessels of this class, but by those worthy of ourselves—a fleet of *Warriors*.

A NEW submarine telegraph cable, two inches in diameter, of four conducting wires, has been laid down between England and Holland.

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Improved Non-Glancing Projectile.

As an illustration of the endless variety of ideas that have been suggested by the new art of constructing iron-plated ships, we give engravings of Warburton's shot.

Fig. 1 is a perspective view, and shows the appearance of the projectile immediately after its escape from the cannon. It is intended for smooth-bored guns, and is provided with expanding wings, *b b*, plainly shown in Fig. 2, which is a longitudinal section; these wings are to keep the projectile point foremost during its flight. The forward portion, A, of the projectile is of solid metal, and has a rod, *d*, extending from its rear in line with its axis, and on this rod, the rear portion, B, is fitted to slide freely, being prevented from coming entirely off by the head, *i*, with its shoulder, *x*. C is a sabot at the base which leaves the shot on its escape from the gun, allowing the wings to be thrown out by the springs, *c c* (see Fig. 4). During the flight of the projectile, the forward portion, A, moves forward in advance of the rear portion, and when it is arrested by coming in contact with any solid body, the rear portion slides forward on the rod, *d*, giving a second blow; and the inventor imagines that these two blows will have more force than the single blow given by a solid projectile of the same weight.

A distinctive feature of this projectile is its point, which is clearly shown in Figs. 1 and 3. When discharged against an inclined surface, the point, *e*, catches first, and then the sharp edges of the radiating wings, *a a*, are designed to cut into the substance, and thus prevent the shot from glancing.

This projectile was invented by W. F. Warburton, doing business at 430 Chestnut street, Philadelphia. It has been submitted to the Ordnance Department of the Navy, and we may have something further to say in regard to the manner in which it was received.

Fig. 1

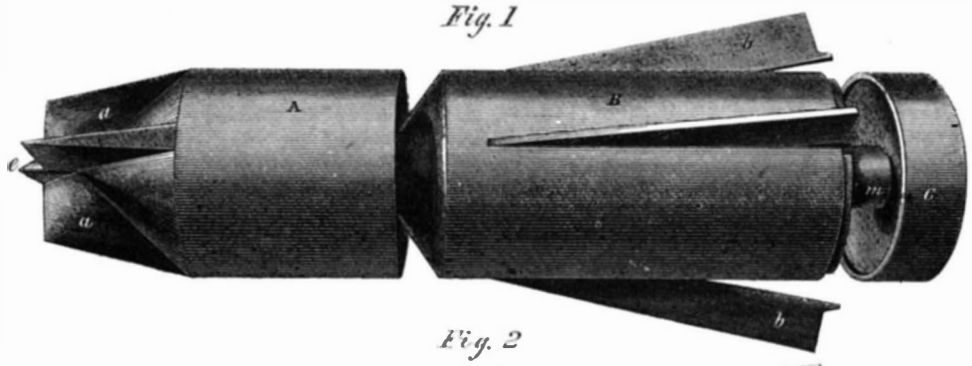


Fig. 2

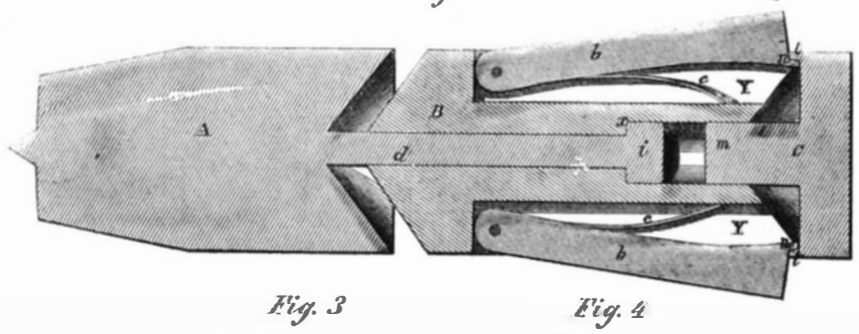
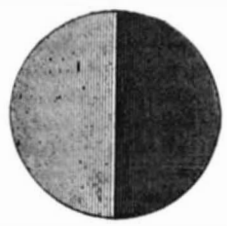


Fig. 3

Fig. 4



WARBURTON'S NON-GLANCING PROJECTILE.

Spring Balance for Safety Valves.

In the spring balance in general use for regulating the pressure on the safety valves of locomotive engines, the pressure is varied by turning a nut upon a rod, and the nut has to be turned so far in order to take off the load, that engineers are very apt to neglect this important duty when the engine is to make but a short stop; thus straining the boiler and encountering the risk of explosion.

The accompanying engraving illustrates an improvement in the spring balance, by which the engineer is enabled to reduce the load on the safety valve, or to take it off entirely, by a single turn of the hand which can be performed instantaneously. It is exceedingly simple and will be understood by a glance at the cuts, of which Fig. 1 is a perspective, and Fig. 2 a vertical section.

The two rods, *a a*, are attached at their upper ends to the lever of the safety valve, and at their lower ends each to the horizontal arm of the elbow lever, *b*. The vertical arms of the levers, *b*, press against a bar, *c*, Fig. 1, which rests against one side of the flat spring, *d*. This spring is forced against the bar, *c*, by means of two screws, *f f*, and a third screw, *e*. The screw, *e*, has attached to its head a lever, *g*, for turning it, and this screw is so near the fulcrum of the spring, *d*, that a single turn of it by means of the lever, *g*, entirely relieves the spring of its pressure against the bar, *e*; thus removing the load from the safety valve.

Fig. 1

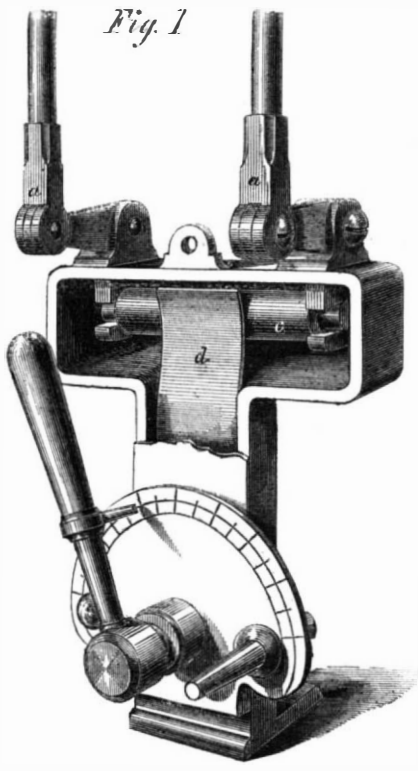
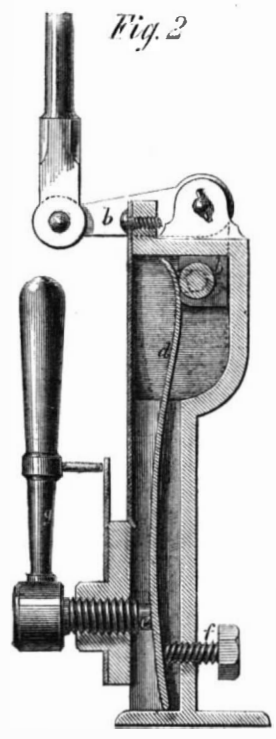


Fig. 2



HUGHES'S SPRING BALANCE FOR SAFETY VALVES.

The pressure is adjusted by means of the screws, *f f*, and the heads of these screws should be rendered inaccessible to the engineer by protecting caps.

The lever, *g*, carries an index which traverses over a graduated arc, by which means the engineer may readily set his safety valve at any desired pressure. The head of one of the screws, *f*, is elongated to form a stop, in order to prevent the engineer from setting the pressure above the point at which it may have been adjusted.

The patent for this invention was granted through the Scientific American Patent Agency, September 3, 1861, and further information in relation to it may be obtained by addressing the inventor, Jas. Hughes, at Scranton, Pa.

SCHAU'S BOILER SCALE PREVENTER.

The *Franklin Journal* gives the following description of this apparatus:—It consists of a cylinder closed on top and connected with the boiler by a short tube. Into this cylinder the feed water is thrown in a shower, so that the heat of the steam brings it instantaneously to the boiling temperature before it reaches the boiler. The rise of temperature precipitates the solid matters which are deposited in the cylinder, while the water in a purified state goes to the boiler. An Austrian locomotive provided with this apparatus ran over 5,500 miles (8,880 kilom.); during which about 45 lbs. of a soft material like soap was deposited in the cylinder, while the boiler was kept perfectly clean. This result is the more remarkable, since at the beginning of the experiment it was coated, to a thickness of 3-10 of an inch, with a solid crust, which completely disappeared during the experiment.

M. Engerth, State Counsellor, who presided at the meeting of Austrian Engineers, to which the above was communicated, remarked that it was probably his experiments on locomotives which suggested to M. Schau the first idea of his simple and ingenious apparatus. It is known in fact that when the feed water returns to the tender after being strongly heated, there is formed in that reservoir a considerable deposit, whilst the boiler itself is comparatively free.

Singular Explosion of a Barrel.

On Thursday, 14th inst., a singular accident occurred in front of Messrs. Cornell's iron railing establishment, Center street, in this city. A barrel, supposed to be empty, and which had contained petroleum—benzine, was lying on the sidewalk, when a man named Michael Travers in passing down the street struck a match across the head of the cask to light his cigar, when instantly with a loud report it exploded, knocking down Travers and lacerating his hand severely. The noise of the explosion attracted a large concourse of people to the spot, and considerable excitement was manifested over the accident. Some benzine had undoubtedly been left in the barrel and had evaporated into gas with the heat of the sun, and mixing with about eight volumes of the atmosphere, it became as explosive as a charge of gunpowder.

THE quantity of iron made from the ore in Great Britain last year, wan 4,150,000 tuns.

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VOL. VII. NO. 9.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, AUGUST 30, 1862.

EXPLOSIONS OF BOILERS---RENEWED DISCUSSIONS OF THEORIES.

No subject has been more frequently discussed than "the cause of steam boiler explosions." It is one of those questions which in its very nature demands frequent attention. New circumstances and repeated calamities call for further investigation and discussion. The subject has lately been before the Academy of Sciences in Paris; and communications upon it have appeared in the London *Engineer*, *Mechanics' Magazine*, and one in the New York *Daily Times*. Various and contrary theories have been presented. All cannot be right, but each should be carefully examined and candidly judged. The author of the article in the New York *Times* calls attention to "the momentous issues which hang" upon the boilers of the three hundred steamers now employed by the Government, and says :—

Quite recently, while experimenting for a very different purpose, Mr. Edwin Stevens, of Hoboken, developed the great fact that water cannot exist as water, under the atmospheric pressure, at a higher temperature than 212°. Now, the temperature of the water in a boiler under steam pressure of 100 lbs. is 330°. If, then, the steam, pressing on this water, can instantly escape, as through a rupture caused by mere weakness of the metal or by overpressure, a great part of this water at 330° will instantly flash into steam, carrying the rest with it at about the velocity of a cannon ball. So far we know. The theory is, that this flying body of inelastic water particles operates like so many projectiles—like a broadside of grape—tearing into pieces everything within reach. Thus explosions start in simple ruptures, and ruptures always result from carelessness.

It is generally admitted that an explosion is caused by a pressure of steam greater than the metal of the boiler can withstand. Some explosions have probably occured by overpressure gradually accumulated, but many have undoubtedly been caused by overpressure from a great quantity of steam suddenly generated, its mechanical action being similar to the ignition of gunpowder in a confined space. A variety of opinions exist with regard to the cause of the rapid generation of steam in many cases. The rupture theory, presented in the above extract, is liable to the charge of being illogical. As an explosion cannot take place in a boiler after a rupture, unless the pressure is subsequently greatly elevated, it is apparent to reason, that all the steam generated by the surplus heat in the water, must be of a reduced pressure to that which produced the rupture. The molecules of water are so mobile that they cannot produce an effect like grape shot. The scientific world will certainly be astonished to be informed at the present day, that Mr. Stevens developed the fact that water heated above 212° cannot exist as water under atmospheric pressure. It is one of the most widely known facts of science.

Another cause of the rapid generation of an overpressure of steam, is the use of water deprived of atmospheric air in the boiler. In 1847, Professor Donny, of Ghent, in making some experiments, discovered that water deprived entirely of atmospheric air could be heated to 275° Fah., without boiling, but when elevated a few degrees above this point, it flashes into steam with the rapidity of a gunpowder explosion. Boilers kept under fire for some time, with deranged feed pumps, are deprived of atmospheric air, and they thus, according to Professor Donny's discovery, become as dangerous as gunpowder magazines in the vicinity of a conflagration. Many very violent boiler explosions of an apparently mysterious character may be explained by this theory, which has lately been discussed in the Paris Academy of Sciences. The use of Giffard's injectors, in place of feed pumps, whereby a constant supply of water containing air is furnished to boilers, when standing still as well as when the engine is running, should prevent explosions from this cause.

Various other theories respecting the causes of steam boiler explosions have been presented to the public. We cannot now occupy space for their reproduction. Our subject, at present, principally is to direct the attention of scientific and practical men to the subject for more careful and profound investigation. Many explosions have lately taken place, both at home and abroad, and an apparent mystery seems still to hang over some of them. We are positive, however, that most of the boiler explosions which have taken place, can be traced to ignorance or carelessness on the part of those who were entrusted with their management. All such catastrophes may be prevented by care, proper attention and intelligence, admitting either of the theories presented to be correct. Since no less than 300 steamers are now employed by our Government, and under very exciting circumstances, unceasing vigilance over the boilers should be exercised by all our naval engineers. Thus far they have given a good account of themselves.

INDIAN CORN FOR ENGLAND.

A correspondent of *The Prairie Farmer* in England, pays a glowing tribute to indian corn, and states that England to-day wants cheap bread for her people more than all other things, and America can give her this. The people of England are feeling the calamities of this war more than those of our northern States, because hundreds of thousands of them are deprived of employment on account of the stoppage of the cotton factories. Indian corn, he believes, can supply them with cheap bread, and Illinois alone can furnish almost all that is necessary. Little is known in Great Britain, however, respecting indian corn. It is chiefly regarded as food for animals, and as being totally unfit for human use. This is not surprising, as most of that which arrives at British ports is musty, and this is the point to which we wish to direct the attention of grain shippers. It is asserted by this correspondent that all the corn which he has seen in Europe is no better than that which is rejected by inspectors at Chicago. That which is designed for transportation should be kiln dried, and when designed for bread in England, it should be bolted like wheat when it is ground. On our lake boats, canal boats and ocean vessels which carry grain, too little care is bestowed upon it, to keep it dry and well aired. Corn when shipped in bulk is very liable to heat and become musty, especially when kept in the holds of vessels, where the atmosphere is always damp, and where no provision is made for ventilation. To carry grain properly on water, it should either be kept in perfectly air-tight bins, or it should be frequently turned over and currents of fresh air driven through it. Millions of bushels of wheat and corn are ruined annually by the carelessness of those who carry them and the inefficient means which they employ for securing such grain from injury.

OUR IRON-CLAD FLEET.

The number of iron-plated vessels, including those finished and those in process of construction for the United States Government is stated at the present time to amount to 49. Of these 21 are for the Western waters and 27 for the Eastern coast. These have all been described in our pages with the exception of the first of the Western gunboats, and a good idea may be had of these from the description and illustration of the ram, *Arkansas*, in our present number.

FILLING OF THE GREAT RESERVOIR.

The water was let into the new reservoir located in Central Park, this city, on the 19th inst. It is one of the greatest artificial water basins in the world. The entire space inclosed is 106½ acres, and 96 are covered with water. It is 30 feet deep and can hold one billion of gallons. The reservoir is divided into two great compartments by a bank 33 feet in hight, 117 wide at the bottom and 15 feet at the top. Its form is irregular, which is due in a great measure to the nature of the ground. A vast amount of rock blasting was necessary to obtain the requisite depth. It has three gate houses, the banks on the inside are faced with cement, on the outside they are covered with grass. This reservoir will afford a large stated supply of water to the city, if one or several of the main distributing pipes should accidentally be injured. It is over three years since its construction was commenced, and it cost $1,500,000. It is a beautiful artificial lake and adds greatly to the attractions of the Central Park, while it furnishes the city with "its crystal drafts of heaven distilled beverage."

THE POST OFFICE---ITS RISE AND PROGRESS

The Post Office has formed an important department in every civilized country since the days of Cyrus, the Persian, who is accredited with the origin of regular postal arrangements between different parts of his empire. His couriers, however, only carried government dispatches, still this was the initiation of the system. The Germans claim that a regular postal system for carrying the letters of citizens was first adopted in the Republic of the Hanse Towns in the thirteenth century, and from thence it extended to other parts of Europe. No well defined system existed in England up to the reign of Charles I., who, by royal proclamation, established post offices in various cities and towns in England and Scotland, and transmitted the mails regularly between them. In those days the mail bags were carried on horseback and on foot, as traveling by carriages was unknown, and macademized roads had not been invented. No provision, however, was made for the transmission of letters inside of cities until about 1663, when an upholsterer in London, named Robert Murray, set up a penny post and express, and delivered letters and parcels several times every day in various parts of that city. This enterprise was very beneficial to the merchants and people, and it promised to be lucrative to its author; but the Duke of York (afterward James II.) claimed that it was an infringement of a post office monopoly granted to him by his brother the king, and so the profits of the first London penny post went to swell the revenues of the selfish duke.

In 1692, a postal system was projected for the American colonies, but it was not organized until 1710. In 1753, Benjamin Franklin was appointed Postmaster General for the colonies, and his practical mind soon devised superior modes of managing the details and improving the revenues. In 1789, the adoption of the Constitution conferred the power upon Congress of managing the post office. In 1790, there were only 75 post offices in the United States, and the total revenue was but $37,935. The rates of postage from the new organization of the department until 1816, were for a letter written on a single sheet of paper 8 cents, carried a distance under 40 miles; over this and under 90 miles 10 cents; over this and under 150 miles 12½ cents; over this and under 500 miles 25 cents. These rates were modified, but not reduced in 1816, and so continued for many years afterward although they were felt to be very high. In 1836, the Hon. Edward Everett brought up the subject of reducing the postal rates in Congress; but no well digested plan was offered for adoption. About this period nearly the same rates of postage prevailed in Great Britain, but a new Parliament elected under the Reform Bill had come into power, and one member of it—Mr. Wallace, of Kelly—had resolved to devote his energies to reforming the post office, and he was ultimately successful. No proper occasion was neglected by him in introducing the subject, and he succeeded in obtaining the appointment of a committee te investigate the whole system and report to Parliament. An original and practical man in the person of Mr. Rowland Hill, a secretary in one of the Government offices, had his mind directed to the subject, and by a thorough examination of the income and expenditures and the modes of conducting the post offices and carrying the mails, he came to the conclusion that a universal penny post system for the United Kingdom would be successful. He, therefore, made his plans and proposed the new system for adoption. At this period—1837—there were but 76 millions of letters carried annually by the British Post Office, and to pay all expenses by the new system it required 380,000,000 letters to be carried. Mr. Hill calculated that the reduced rates of postage

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would vastly increase the number of letters, and his method combined improved modes for reducing the expenses of managing the offices. In the strong faith that such an increase would be obtained in a few years at furthest, the Reform Post Bill passed Parliament in 1839, and went into operation in 1840. There was a deficit in the first year after it went into force, but the revenues have been steadily increasing ever since, and last year—1861—the stupendous number of 593,000,000 of letters were carried. In 1839, the number of letters carried for each person in England was 4; in Scotland 3; in Ireland 1. Last year it was 24 for each person in England, 19 in Scotland and 9 in Ireland. In 1838, the revenue of the British Post Office was $11,734,390 in 1861, $16,500,000. Notwithstanding there has been such a reduction in the rates of postage and such an increase of mail matter to carry, the use of stamps, and the improved modes of travel by steamboat and railway have actually reduced expenses, for there is now a surplus revenue of $7,500,000 per annum.

Besides the organization of a cheap postage system for letters, Rowland Hill introduced the carrying of books and small parcels by the post office, and no less than 12,000,000 of book packages were carried by this method in England last year. Another important improvement also introduced was the money order system, by which money paid into any British post office can be drawn by order at any other. The value of money orders thus transmitted last year was $73,081,700.

The success of Rowland Hill's cheap and comprehensive postal system soon attracted attention in America, and in 1843 the Postmaster General—Mr. C. A. Wickliffe—presented an elaborate report on the subject, and proposed some reduction of the previous high rates. In 1845, a bill was passed by Congress reducing the previous high rates to 5 cents for every letter under half an ounce in weight, carried 300 miles, and 10 cents for all over that distance. In 1851, 1852 and 1855, these rates were modified and other alterations made in our postal system. The rates now established are 3 cents for a single letter for all distances under 3,000 miles and 10 cents for distances over this. All inland postage must be prepaid; circulars and transient newspapers under 3 ounces 1 cent; every additional ounce 1 cent; periodicals published monthly, and pamphlets of not more than sixteen octavo pages, sent in packages of not less than 8 ounces, ½ cent per ounce prepaid; 1 cent if not prepaid. Books less than 4 pounds under 3,000 miles 1 cent per ounce; over this distance 2 cents per ounce, and fifty per cent added when not prepaid. In 1852, postage stamps and stamped envelopes were ordered; and the only modifications adopted of late years have been the street letter boxes on the lamp-posts, and the reduction of city carriers' fees to one cent per single letter. Exchange newspapers, magazines, &c., sent to editors are free; weekly newspapers to subscribers in the county of publication are also free; out of the county and under 50 miles, 5 cents per quarter; over 50 and under 300, 10 cents; over this and under 1,000, 15 cents; over this and under 2,000, 20 cents; over this and under 4,000, 25 cents. Monthly papers and semi-monthly half of these rates, and if paid quarterly in advance a reduction of one half is made.

The franking system by which members of Congress can send letters and packages free by post, belongs to the worn-out privileges of the English Parliament. From the Postmaster General's report of 1861 we learn that there are 28,620 post offices in all the States. The total revenue for the year was $9,049,296; expenditures $13,606,759. Thus, while the revenues are about three million of dollars less than those of Great Britain, the expenditures are $4,606,000 more. The excellent roads in England, the small extent of country with its dense population render the carrying of the mails very much less expensive in that country than in the vast territory of the United States with its sparsely settled population. We must not overlook the fact, however, that there are about three times the number of letters sent by mail in Great Britain than in the United States, and besides this a considerable revenue is derived from the money orders. This system was imperfectly tried for a short period about fifteen years ago by our Post Office and given up. We think it should be tried again. It is a most convenient method of transmitting money in small sums. Another reform for improving our postal system would be the reduction of the high rates for ocean postage to Europe. For a single letter the rate to England is 24 cents, which is too high. Our Government has proposed a reduction but this cannot be brought about without the mutual action of foreign governments. We trust this question will be persistently agitated until the desired reform is effected, and single letters between America and Europe carried for five, or at most ten cents. The British ocean postal system is managed with great ability. The Cunard Company have carried the mails for twenty-two years, have never broken a contract, incurred no penalties, and never asked an indulgence, as we learn by some remarks made in Parliament. Twelve mail steamers are maintained by British subsidies on the western coast of South America, securing a large trade which naturally should rather belong to the United States.

MANUFACTURE OF SALTPETER.

The successive Governments of France have, for many years, encouraged every invention and improvement in the production of nitrate of soda, to render them, if possible, independent of England for the necessary supply to the gunpowder works. The artificial niteries or niter beds collected for this purpose, consist of animal matter, the rubbish from the walls of old houses, stable litter, refuse of plaster works, &c. The decomposition of the animal matter produces carbonate of ammonia, which, dissolved in water, in connection with the air charged with oxygen, is transformed into nitrate of ammonia. This product, under the influence of the solar ray, and the action of time decomposes the calcareous and magnesia carbonates in the plaster rubbish, forming nitrates of lime and magnesia and reproducing carbonate of ammonia, which, set at liberty, serve anew to form the nitrates. According to this theory, the nitrate plays a double part; it serves to reunite the elements of the atmosphere to produce nitric acid, and it causes this acid, formed under its influence, to act on the insoluble carbonates, to change them into nitrates. But this action is not the only one; for Kuhlmann discovered that in most instances the ammonia itself was decomposed, and that its nitrogen, combined with the oxygen of the atmosphere contained in the water, is thus transformed into nitric acid. These calcareous and other earthy nitrates dissolved in water are decomposed by sulphate of soda, thus forming nitrate of soda and sulphate of lime by double decomposition. The nitrate of soda is then heated with chloride of potassium and nitrate of potash (saltpeter), and chloride of sodium (common salt) obtained.

Saltpeter is obtained in the Mammoth Cave, Kentucky, and considerable quantities were obtained from this source during the war of 1812. It is derived chiefly from the excrements of bats, &c. Most all the saltpeter which is employed for the manufacture of our gunpowder comes from India. It is not known whether any saltpeter is now obtained from natural sources in the Southern States. If the secessionists were deprived of this substance entirely, they could not carry on a war. The nitrate of soda is very abundant in many parts of the world, and were it not so deliquescent, it would answer just as well for making gunpowder as the nitrate of potash (saltpeter).

The formation of natural saltpeter is a very slow process, requiring about two years to complete. During the French revolution 2,000 tuns were made in one year in Paris, and were foreign supplies cut off twice this quantity could be made in the same space of time in the city of New York with its present number of inhabitants. In Sweden, each peasant who owns a house is bound by law to make a certain quantity of saltpeter every year for the use of the state. In Spain, Egypt, Persia and especially India, vast quantities of this salt are made annually; and it is not only a source of great profit but of warlike power to great Britain.

A Plain History of Iron Plated Ships.

On another page will be found a lecture by the eminent engineer and ship builder, John Scott Russell, on iron ships. Those who have not followed the development of this great subject, which is absorbing the attention of all maritime nations, will read Mr. Russell's lecture with interest, as it is a brief, able and intelligent discussion of the whole subject, while those who have kept themselves informed in regard to the question, will be still more interested in the lecture. Mr. Russell's award of credit to Stevens, exhibits a manly frankness, which we think is characteristic of the really highest class of Englishmen, those of large and cultivated intellects.

VALUABLE RECEIPTS.

Copperas a Disinfectant.—To disinfect a cesspool, dissolve half a pound in a pailful of warm water and throw it in. If the sulphate of iron be dissolved in water and thrown into cesspools it renders them pure, even where the gas is in such quantity as to be oppressive to the lungs and irritating to the nose. The rationale of the process is this. The sulphuric acid of the salt combines rapidly with the ammonia, forming a sulphate of ammonia, and the iron is thrown out as an oxide. This salt of ammonia (sulphate) is very soluble in water, and to a great extent inodorous. In addition to this, the ammoniacal gas is most rapidly absorbed by the water of the solution, and thus arrested until the sulphuric acid has time to leave the iron and unite with the ammonia.

Preparing Glue for Ready Use.—To any quantity of glue use common whiskey instead of water. Put both together in a bottle, cork it tight and set it for three or four days, when it will be fit for use without the application of heat. Glue thus prepared, will keep for years and is at all times fit for use, except in very cold weather, when it should be set in warm water before using. To obviate the difficulty of the stopper getting tight by the glue drying in the mouth of the vessel, use a tin vessel with the cover fitting tight on the outside to prevent the escape of the spirit by evaporization. A strong solution of isinglass made in the same manner is an excellent cement for leather.

Mahogany Stain for Wood.—The planed surface of the wood is first rubbed with dilute nitric acid (aquafortis), made with one ounce of the acid added to eight of water. One ounce of dragon's blood is dissolved in nearly a pint of spirits of wine, this and one-third of an ounce of carbonate of soda are then to be mixed together and filtered, and the liquid in this thin state is to be laid on with a soft brush. This process is to be repeated, and in a short interval afterward the wood possesses the external appearance of mahogany. When the polish diminishes in brilliancy, it may be restored by the use of a little cold drawn linseed oil.

To Obtain Fresh Blown Flowers in Winter.—Choose some of the most perfect buds of the flowers you would preserve, such as are latest in blowing and ready to open, cut them off with a pair of scissors leaving to each, if possible, a piece of the stem about three inches long; cover the end of the stem immediately with sealing wax, and when the buds are a little shrunk and wrinkled, wrap each of them up separately in a piece of paper, perfectly clean and dry, and lock them them up in a dry box or drawer; and they will keep without corrupting. In winter, or at any other time, when you would have the flowers blow, take the buds at night and cut off the end of the stem sealed with wax, and put the buds into water wherein a little niter or salt has been diffused, and the next day you will have the pleasure of seeing the buds open and expand themselves, and the flowers display their most lively colors and breathe their agreeable odors.

Lake Iron Propellers.

This is truly the "Age of Iron." Even on our Northern lakes, where timber is so cheap for shipbuilding, iron is taking the place of wood. A splendid new iron propeller, called *Merchant*, built at Buffalo, N. Y., has lately made her first trip to Chicago, and the papers of the latter city describe her in flattering language. She is to constitute one of a regular line of iron propeller steamers running between Buffalo and Chicago, touching at Milwaukie. All screw steamers should be built of iron. The peculiar action of the screw upon a wooden vessel tends to open her seams, and thus frequent repairs are rendered necessary. An iron vessel, on the other hand, is much stronger in the frame, and the plates being riveted, they do not work loose like the bolted planking of a wooden propeller.

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RECENT FOREIGN INVENTIONS.

New Material Applied to the Arts.—A very remarkable material brought from Southern Africa and on exhibition in London has attracted considerable attention, and has been patented by its discoverer, Thomas G. Ghislin. It is obtained from several marine plants, but principally from the *laminaria buccinalis* which grows in deep sea water, and abounds on the coasts of the Cape of Good Hope. It grows rapidly in large bunches rising from one root. The stalks springing from the parent stem are tubular and increase from half an inch in diameter to three inches, and they are about 18 inches long. As it grows in deep water, all the specimens obtained have been washed on shore, and it is sometimes found piled up in great heaps. It resembles horn in its exterior formation. The outer coating is of a dark color, and when it is removed from the water and becomes dry its similarity of appearance to horn is remarkable. When fresh it is thick and fleshy, but when it is dried it becomes compact and its surface looks like a beautifully-grained deer's horn. After it becomes dry and hard it can be rendered soft again by steeping in water, and in this condition it may be stretched and formed into various shapes. When dry it can also be reduced to powder, then made plastic by soaking in water, and in this condition it may be struck into almost any shape in a die press. It comes out of the molds like articles formed of gutta percha. Picture frames, inlaid work, umbrella handles and gentlemen's walking canes made of it are in the London Exhibition. The inventor, Mr. Ghislin, prepares the plant by cleaning it first with weak caustic alkali and then with dilute sulphuric acid, after which it is washed, and before it is quite dry it may be pressed into sheets or any other form. It then may be rendered very hard by steeping it in a hot solution of alum after which it is removed to a hot room where it is dried, and retains its shape afterward. Reduced to powder it may also be mixed with various substances, like india rubber, and molded into a great variety of articles. When it is bleached by treating it first with a warm alkaline solution, and afterward with sulphurous acid gas, it resembles ivory and may be used as a substitute for that material. The discovery of the properties of this substance and its various applications, are important contributions to science and art. The specification of the patent is published in *Newton's London Journal of Arts* for August.

New Hemostatic and Antiseptic Agents for Wounds.—A patent has been obtained by Pierre A. F. Boboeuf, of Paris, for the preparation and application of new hemostatic and antiseptic agents of alkaline phenates and salts made from mineral and essential oils soluble in caustic potash or soda. They are prepared by taking coal oil or petroleum and stirring it cold in about one-sixth of its weight of caustic soda. It is then allowed to settle for about twelve hours, when it separates into two different layers, the lower one being the phenate of soda. The patentee denominates as phenates the compounds formed by a combination of any of the acid oils with alkali. The phenate of soda formed as described is run off by a tap in the bottom of the vessel in which it is formed. The top layer of the oil in the vessel is neutral and limpid. The phenate thus obtained should not mark more than 16° or 17° Baume, and water is added to reduce it to 5° for use. Phenates thus obtained, are applied to wounds to stop hemorrhage as follows:—If the wound has been produced by a cutting instrument, several folds of a surgeon's compress are dipped into the liquid and applied to the wound. "It neither causes pain nor irritation," says the inventor. The compress is pressed upon the wound and the phenate freely applied upon the outside with a rag. A second compress is then applied, and sometimes four are required, but seldom more. The phenate coagulates the albumen of the blood and stops its further issue. If the hemorrhage is caused by a bayonet or bullet, the phenate solution is injected two or three times into the wound, then the opening is filled with lint soaked in the solution. After the bleeding has been stopped for three hours, all the compresses placed over the first one may be removed, as the blood with which they are impregnated becomes very hard. But, should they adhere tenaciously, they need not be removed for two or three days. The superiority o these phenates for wounds is stated to be due, not only to the property which they possess of coagulating the blood, like the perchloride of iron, but also because of their rendering the edges of the wound insensible, and causing the injured tissues to contract by acting upon them in a similar manner to tannic acid. Such phenates may also be converted into dry powder by evaporation, and applied to wounds on moistened cloth.

Composition for Protecting Iron Ships.—Wm. J. Hay, of Southsea, England, has taken out a patent for a paint formed of the protoxide of copper ground in linseed oil, and boiled in it until it is reduced to a suboxide. A quick drying, cupreous oil is thus formed. This paint may be thinned for application with naphtha or turpentine. Before it is applied, the iron vessel should first receive two non-conducting coats of red or white lead, or asphalt varnish, and when dry the copper oxide paint is put on the top in two successive coats. This paint, it is said, protects the hulls of iron vessels from the sea animalcules adhering to them, and if applied to wooden vessels or wood exposed to the ravages of the sea worm, it is said to be a protective for these also.

Galvanized Iron for Armor-Plated Ships.

At a recent meeting of the Manchester Literary and Philosophical Society, Dr. Calvert read a paper on the employment of galvanized iron for armor plated ships. He said: Many gentlemen present are doubtless acquainted with the fact that he had been for some time past engaged in ascertaining the chemical composition of various woods employed and susceptible of being employed in the navy. On a recent visit to one of the dockyards he found that while the armor plates were fired against a layer of teak, the ribs of the ship were of oak, and that the iron bolts which were to fasten the plates were to pass through the oak ribs. It occurred to him that the inconvenience which would probably result from the action of the oak upon the iron might be obviated by substituting galvanized iron bolts for those now in use, and he therefore instituted a series of experiments, the results of which he had great pleasure in laying before the meeting.

The first series of experiments consisted in having driven through large pieces of oak, bolts and screws of iron and galvanized iron, prepared by his friends, Messrs. Richard Johnson & Brother, of Dale street, Manchester, which were then immersed in salt and sea water for the last three months. The results clearly showed, first, that the friction did not remove the zinc from the galvanized iron; secondly, that the oak and galvanized bolts were unchanged; whilst in the case of the iron bolts, they were much rusted, and the pieces of oak had become quite black by the formation of tannate and gallate of peroxide of iron. During the experiments the waters were changed every week, and those containing the galvanized iron appeared unchanged, whilst in the case of the iron, they had a dark blue-black appearance, owing to the formation of gallate and tannate of iron.

In order to ascertain the comparative action of soft and salt water upon iron and galvanized iron when in contact with oak under identical circumstances, he made the following series of experiments:—

Plates of galvanized iron having 18 inches of surface, lost during three months the following weights:—

	SOFT WATER.	SEA WATER.
Plate No. 1	0·10 grains	———
Plate No. 2	0·11 grains	———
Plate No. 3	0·095 grains.	
Plate No. 4	0·090 grains.	

Similar plates of iron lost during the same time:—

	SOFT WATER.	SEA WATER.
Plate No. 1	1·23 grains	———
Plate No. 2	1·52 grains	———
Plate No. 3	2·40 grains.	
Plate No. 4	2·38 grains.	

There can therefore be no doubt that galvanized iron offers great advantages, the action of water on it being less than a tenth of the same action on ordinary iron. As there is no doubt that iron when galvanized is in the most favorable electrical condition to resist the action of oxygen, being in an electro-negative condition, it follows that in all probability the use of galvanized iron would be very advantageous in armor-plated and other iron ships. The author hoped that Government and other large shipbuilders would avail themselves of this suggestion, and make experiments on a large scale to verify the results he had obtained.

RECENT AMERICAN INVENTIONS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list:—

Knitting Machinery.—This invention relates in part to a substitute for the beaters, or as they are sometimes termed, pressers, employed in those knitting machines in which several needles are knitted upon at once with separate yarns, to operate between the needles for the purpose of holding the work to its proper place thereon, while the stitches are being formed, either by the movements of the needles themselves, or by what are termed stitch hooks. The beaters or pressers above mentioned have a complicated movement which requires complicated mechanism to effect it, and the object of this improve is to effect the same result by a simpler movement and less complicated mechanism, and to this end it consists in substituting for the said beaters or pressers a pad of india rubber, or other moderately soft or yielding substance, so applied and having such a movement as to operate in combination with the needle ring or needle bar and the needles. Another part of the invention consists in a new and improved stop motion to throw the driving pulley out of gear, or otherwise disengage the machine from the driving apparatus whenever one of the yarns breaks or gives out. The inventor is James G. Wilson, of New York city.

Repeating Firearms.—This invention relates to the supplying of cartridges to the barrel through the breech from a magazine in the stock, by means of an endless chain working in the magazine. There is used in combination with such a magazine and endless chain, a movable breech pin, whose opening and closing movement is directly backward and forward toward and from the barrel; and the invention consists in certain means in combination with such a breech, for the purpose of giving the said chain the necessary movement, and conveying the cartridges from the belt into the chamber of the barrel. It also consists in the employment in combination with the magazine in which the endless chain feeder works, of a second cartridge magazine arranged side by side with the first one, and separated therefrom by a partition which is movable for the purpose of transferring its cartridges into the first one when that has been emptied, whereby provision is made for carrying in the stock, nearly twice the number of cartridges that could be carried in the single magazine. The inventor is J. Q. A. Scott, of Pittsburgh, Pa.

Instrument for Sounding.—This invention consists of certain improvements in that class of instruments used for sounding or as a log, in which a helix or screw propeller is made to revolve by the action of the water upon the threads or blades of the propeller, the number of revolutions of said propeller being registered by a combination of endless screws and wheels, to which motion is imparted by the revolutions of the propeller, and which are provided with suitable indices to work the number of revolutions of the registering wheels. The invention consists in the combination of the rising and falling blades with a framework and registering mechanism, in such a manner, that the whole weight of the lead, and the strain of the line is sustained by the framework, and not by the axis upon which the blades revolve, said framework being composed of thin arched ribs which protect the blades and the wheelwork from injury; it consists further in certain improvements of the registering mechanism, the object being to reduce the same to the smallest possible compass, at the same time increasing its capacity and facilitating its operation. The inventor is W. P. Trowbridge, of New York city.

Preparation of Tobacco Leaves.—The object of this invention is to prepare the stalks of tobacco leaves, so that they can be used with the leaves for fillers of cigars, no stripping being required. The invention consists in passing the leaves of tobacco through between rollers, arranged so as to act on and compress the stalks without touching or injuring the leaf itself, thereby flattening said stalks, and rendering the same fit to be used with the rest of the leaf for fillers of cigars. The inventor is Henry Walter, Sen., of Elizabeth City, N. J.

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ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING AUGUST 12, 1862.

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*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

36,132.—John Absterdam, of New York City, for Improved Composition for Covering Projectiles :

I claim a composition of sulphur and plumbago for coating, covering, banding and cementing cannon, mortar and small firearm projectiles, substantially as described.

I also claim a composition of sulphur and steatite for coating, covering, banding and cementing cannon, mortar and small firearm projectiles, substantially as described.

I claim also the employment of sulphur, in combination with mineral or earthy substances, to form a material or composition for coating, covering, banding and cementing cannon, mortar and small firearm projectiles, substantially as described.

36,133.—A. P. Allen, of Niagara, N. Y., for Improvement in Railroad Journal Lubricator :

I claim the use of one or more rollers revolving in the reservoir, E, together with the springs, L L, or their equivalent, when used in combination with the oil-tight chamber, C, substantially and for the purpose specified.

36,134.—S. F. Ambler, of Brooklyn, N. Y., for Improvement in the Manufacture of Aerated Bread :

I claim, in the manufacture of unfermented bread, the use or employment of the carbonic acid gas made as herein fully described, for the purposes specified.

36,135.—E. Beeman, of Owego, N. Y., for Improvement in Hand Drills :

I claim the manner of rotating a drill stock by means of a cord passing around it and around pulleys, making it a convenient and durable tool as above described.

36,136.—T. E. C. Brinley and J. G. Dodge, of Louisville, Ky., for Improvement in Plows :

We claim the lock joints, as shown in Fig. 5, shown by the letters d e f and g, in connection.

We also claim the arrangement of the brace, round or rod, a, so that it operates both as a brace and fastening of the handle, A′, into the loops, c c.

36,137.—W. L. Burt, of Cambridge, Mass., for Improvement in Street Railway Carriages :

I claim the combination and arrangement of the roller or rollers, D, with the carriage or the truck frame and its appendages, and also with the deflector, I, arranged with the main track and the turn out, as set forth, the whole being so as to operate substantially as specified.

I also claim the application of the lever frame, E, to the carriage axle and its wheels, in manner so as to be capable of operating with respect to the same, substantially as described.

36,138.—Valentine Chase, of St. Mary's Parish, La., for Improvement in Tenoning Machines :

I claim the combination of saws upon the adjustable plates, or their equivalents, by which the sides and shoulders of tenons may be cut at one operation ; and whereby tenons of different sizes are made ; the tenon being cut and completed by one movement of the timber, all substantially as described.

Also, I claim in combination with the saws and adjusting plates by which the size of the tenon may be varied, the adjusting slots and screws in and shifting position of plates 3 and 4, by means of which the edges or peripheries of the saws which form either side and shoulder of the tenon may be adjusted to the same vertical line, and thus compensate for the wear of the saws, substantially as described.

Also, I claim the construction and arrangements of the plates, 1 2 3 and 4, operated in the manner and for the purposes specified,

36,139.—N. B. Cooper, of Gratis, Ohio, for Improvement in Cultivators :

I claim the arrangement of the slotted beam, A, adjustable rod, B, and beam, C, for the purpose and in the manner herein set forth and described.

36,140.—J. H. Cotton, of Boston, Mass., for Improvement in the Manufacture of Iron Tubing :

I claim coating iron tubes, as set forth, and subsequently drawing them while cold through dies, in the manner specified, thus producing a tube perfectly cylindrical and smooth upon both its inner and outer surfaces.

36,141.—R. T. Crane, of Chicago, Ill., for Improvement in Steam or Hot-Air Pipes :

I claim the arrangement of one or more partitions, a a′, in the interior of the T-connections, B B′, and between the ends of heating pipes, A A′, in combination with inlet openings, d e, and outlet openings, d′ e′, substantially as and for the purpose shown and described.

[The object of this invention is to arrange pipes which are used for heating buildings or rooms, by steam or hot air, in such a manner that the steam or hot air can be passed through one or more of said heating tubes, and the heat regulated in a simple, cheap and expeditious manner.]

36,142.—L. and P. K. Dedrick, of Albany, N. Y., for Improvement in Horse-Power Windlass :

We claim, first, The combination of the wheel, B, sweep, D, and slide, F, or its equivalent, arranged as shown, to admit of the connecting of the wheel to the sweep and the detaching of the former from the latter, for the purpose herein set forth.

Second, The crossbar, E, attached to the sweep, D, and provided with shoes, g g, arranged relatively with the wheel, B, to serve in connection with the sweep, as a brake for the latter, as set forth.

Third, The slide, F, attached to sweep, D, and the lugs, d, and flanch, c, on the wheel, B, arranged as shown, to admit of a ready connection between the sweep and wheel, and to keep the former in proper position with the latter, as set forth.

[The object of this invention is to obtain a horse power of simple construction which will admit of the machine, which is operated upon by the horse power, being released from the latter at any moment at the will of the attendant. The invention is designed to be applied to the lifting of weights and the operating of presses, such as have their followers arranged to work from the bottom of the press box upward, whereby the weights may be lowered at any speed, and the follower allowed to fall, when necessary, without backing the horse.]

36,143.—Otto Ernst, of New York City, for Improvement in Apparatus for giving Vent to Barrels of Beer and other Liquids :

I claim the arrangement of the vessel, d, water pipe, b, air pipe, e, and two-way plug, c, in combination with the barrel, f, of beer or other liquid, for the purposes and as specified.

36,144.—Daniel Fasig, of Rowsburg, Ohio, for Improvement in Lifting Jack :

I claim the combination of the sliding rod, g, and swinging pawl bar, D, with the lever, E, rack bar, B, hollow rack stock, A, and spring catch, b, as and for the purpose herein shown and described.

[This invention consists in the employment or use of a vertical rack bar fitted within a socket or stock provided with a rack and a spring stop, in combination with a lever attached to the rack bar, and an adjustable pawl attached to the lever, all being arranged in such a manner that, by operating the lever, the rack bar will be elevated through the medium of the pawl and the rack on the socket or stock, the spring stop and the rack of the rack bar, retaining the latter at the desired hight, the rack bar being readily lowered by throwing out the pawl and spring stop from their respective racks.]

36,145.—Thomas Fisler, of Camden, N. J., for Improved Circular Washboard :

I claim the combination of the two circular racks, so as to form a circular washboard, to be used in connection with the wash tubs in common use, arranged substantially as set forth and for the purpose specified.

36,146.—B. W. Franklin, of New York City, for Improved Vulcanizing Heaters or Boilers :

I claim the combination of two or more seamless cups or vessels, H H, and the cap or cover, C, as above described, the whole, when in combination and secured by the bolts or screws, E E E E E, constituting a vulcanizing boiler, substantially as set forth and specified.

36,147.—D. L. Grover and L. S. Wright, of Groton, N. Y., for Improvement in Churns :

We claim the combination of the revolving conical beaters, F and G, running in opposite directions, with the stationary beaters, L, placed in the corners of a square churn, as and for the purposes described.

36,148.—M. F. Hardy, of Seward, N. Y., for Improvement in Revolving Ordnance :

I claim, first, The locking yoke and spring hammer combined, substantially as and for the purpose set forth.

Second, The combination of the turntable, F, slides, E, series of breech pieces, G G, cannon, C, and combined yoke and hammer, D D′, substantially in the manner and for the purposes described.

Third, The combination of the hinged yoke, D, crank shaft, I, cams, J J, connecting rod, j, and hand lever, K, with the cannon, C, and turntable, F, substantially in the manner and for the purposes described.

Fourth, The lever, M, with its pawl, o, and projection, o4, in combination with the bevel notches, p, of the turntable, and the incline, o2, of the strap, f, and the stop, o3, of the slide, substantially in the manner and for the purposes described.

Fifth, The combination of the forked lever, L, stock, B, slide, E, and turntable, F, substantially in the manner and for the purpose described.

Sixth, Charging the breech pieces with balls, substantially as described.

Seventh, The construction of the ball-charging device, substantially as described.

36,149.—Moses C. Haight, of Buffalo, N. Y., for Improved Ankle Support for Skaters :

I claim the device consisting of the parts, A B C D E F and G, constructed and arranged as described.

36,150.—C. I. Hayes and Martin Mewman, of Unadilla, N. Y., for Improved Machine for Edging and Slitting Boards :

We claim the construction of a machine, as described, having two saws on one mandrel, one of which is movable and adjustable, as and for the purpose described.

36,151.—John Hewitt, of Carmichael, Pa., for Improvement in Churns:

I claim the combination and arrangement of the devices, C d e E f g B D i l b, with the blades, H H′ H2 H3, and pins, I I, and the churn box, A, all constructed in the manner and for the purpose described.

36,152.—B. B. Hotchkiss, of Sharon, Conn., for Improved Metallic Defensive Armor :

I claim the arrangement of the plates, 1 2 3, &c., upon the inclined sides of vessels and fortifications, so that the lower plates shall overlap upon the higher, in the manner and for the purpose herein set forth.

36,153.—F. J. Huber, of Cleveland, Ohio, for Artificial Stone :

I claim an artificial stone composed of lias lime, coal ashes and pulverized bricks, when this composition is used with or without the additional ingredients, substantially in the manner and for the purpose herein described.

36,154.—F. J. Huber, of Cleveland, Ohio, for Artificial Stone :

I claim an artificial stone composed of lias lime and slate clay as principal components, when the composition is prepared with or without the additional ingredients, substantially in the manner and for the purpose herein described.

36,155.—F. J. Huber, of West Cleveland, Ohio, for Improvement in Building Blocks :

I claim forming a rectangular molded building block with oblique grooves on two or more of its vertical sides, said grooves being at an angle with each other and with the edges of the building block, so as to form continuous oblique grooves across the face of the wall, when laid in the usual way of bricklaying, substantially in the manner and for the purposes described.

36,156.—Alfred Ingalls, of Independence, Iowa, for Improvement in Sugar Cane Crushing Mills :

I claim the revolving cutters, C C, arranged and operated in combination with the pressing rollers, A A′, as specified.

36,157.—E. T. Ingalls, of Haverhill, Mass., for Improved Hand Pegging Machine :

I claim the above described improved pegging machine as made with the peg driver and the awl, arranged with respect to each other, and to operate in one hole, in the manner substantially as hereinbefore specified.

36,158.—I. B. Jones, of Xenia, Ohio, for Improvement in Cultivators :

I claim the laterally-moving or adjustable plow frame, D, when operated as shown, to wit, by means of the toothed segments, E E, on the rock shaft, F, gearing into the racks, d d, on the frame, D, and the latter fitted in the mounted frame, A, as and for the purpose set forth.

I further claim the manner of attaching the plow standards, H, to the frame, D, to wit, by placing the standards in guides, i, attached to pendants, I, secured to the frame, D, and securing the standards at any desired hight by means of the catches, J, as and for the purpose specified.

[The object of this invention is to obtain a plow for the cultivation of crops which are grown in hills or drills, and one which will have its plows under the complete control of the operator, so that the latter may move or shift the plows laterally to conform to the sinuosities of uneven rows and thus insure the plants being plowed in a perfect manner and without danger of being plowed out of the hills or drills.]

36,159.—W. M. Jones and S. E. Tyler, of Horicon, Wis., for Improvement in Seeding Machine :

We claim, first, the cylinder, I, with the curved buckets, k, attached secured to a rotating and sliding or longitudinally adjustable shaft, F, in connection with the stationary head, J, and semi-cylinder. K, provided with an opening, l, all being arranged within a suitable box, D, and in such relation with a seed box, C, as to operate in the manner and for the purpose herein set forth.

Second, The curved plate or gate, L, placed or fitted within the semi-cylinder, K, connected to the cylinder, I, and arranged in relation with the opening, l, of the semi-cylinder, K, and the buckets, k, to operate as and for the purpose specified.

Third, The arrangement of the clutch, F, collar, e, pinion, f, and shaft, E, as shown and described, for the purpose of admitting of said shaft being thrown in and out of gear with the wheel, B′, and also admitting of said shaft being adjusted longitudinally when desired, as set forth.

[This invention relates to a new and improved seeding machine for sowing seed broadcast, and consists in a novel and improved means for discharging the seed from the seed box or hopper, whereby the discharge of the seed may be graduated as desired, so as to sow a greater or less quantity on a given area, and the seed-distributing apparatus prevented from becoming choked or clogged, and the seed also prevented from being broken or bruised in being discharged and at the same time scattered in a perfect broadcast manner.]

36,160.—Alexis Longett, of New York City, for Improvement in Velocipedes :

I claim mounting the carriage body on three wheels, C C E, arranged on independent axles, a, and imparting motion to two of said wheels, C C, separately by cranks, J, through the medium of gear wheels, e f, bands, n q, and grooved pulleys or sheaves, K m s, secured respectively on independent axles, l a o, when said parts are arranged to operate in the manner and for the purposes specified.

[The object of this invention is to obtain a light vehicle capable of carrying three grown persons, and with that load easily propelled by one of them over a common road. The invention consists in placing the propelling wheels on independent axles, and communicating motion to them separately, by cranks, through intermediate gear wheels and sheaves.]

35,161.—P. W. Mackenzie, of Jersey City, N. J., for Improvement in Cantering Propellers :

I claim, first, the arrangement of the universal joint, a, in combination with the hind legs, A′, or the fulcrum of the cantering toy and with the steering wheel, B, constructed and operating substantially in the manner and for the purpose described.

Second, The hinged legs, A″, in combination with the body of the horse and with the cranks, c, as and for the purpose specified,

Third, The arrangement of the foot rests or false stirrups, H, in combination with the handle, I, constructed and operating substantially as and for the purpose set forth,

Fourth, The arrangement of the double-armed levers, e g, and diagonal cords, f, in combination with the handle, I, and steering wheel, B, constructed and operating substantially as and for the purpose shown and described.

[The object of this invention is to conneet, in a convenient and durable manner, a hobbyhorse or other toy of a similar nature, to wheels so that by imparting to the horse a cantering motion the wheels will be rotated and the horse propelled to any desired place and in any desired direction.]

36,162.—Melchor Mellinger, of Dayton, Ohio, for Improved Clothes Washing Machine :

I claim the slide, k, fitted in the press board, H, and having the connecting rod, I, attached for the purpose of admitting of the removal of the connecting rod, I, and hook, J, for the adjustment of the plunger, F, out of the suds box, as described.

[This invention consists in a novel and improved combination and arrangement of a plunger and press board, whereby it is believed that the clothes will be acted upon in a more efficient manner than hitherto. The invention also consists in a novel wringing device applied to the washing machine and arranged in such a manner therewith that the clothes may, after being washed and cleansed, be wrung with the greatest facility.]

36,163.—Gordon McKay and R. H. Mathies, of Boston, Mass., for Improvement in Sewing Machines :

We claim so arranging and combining with a sewing mechanism, the projecting rotating horn which encases and sustains the whirl or looper, and which supports the stock, that said horn can be rotated with the stock upon it, in reference to the needle and feeder, when it is desired to have the seam conform to curves or angles, instead of turning the stock upon the horn, or of turning the needle and feeder with reference to the horn. Also combining with the rotating projecting horn, e, so as to rotate with it a thread or bobbin, operating substantially as described, and also combining with the rotating projecting horn, e, so as to rotate with it a tension device which acts upon the thread, operating substantially as described.

Combining a rotary whirl or looper with a rotating horn, so that while the whirl has an intermittent rotary movement with relation to the needle, the horn can be rotated without changing the relative relation of the whirl and needle to each other, or in other words, so that rotation of the horn shall not rotate the whirl, though supported by and held in the horn, and so that rotation of the horn shall not affect the intermittent rotary movement of the whirl.

Combining with the needle carrier of a sewing mechanism, a lever which reciprocates said carrier, and which has its fulcrum so arranged as to be made movable for the purpose of changing the throw of the carrier.

The means described for varying the stroke of the needle, to conform, to change in the length of the stitch, the same consisting of a stop made adjustable on the fulcrum bar to vary the distance between said stop and the fulcrum.

Regulating the amount of the thread drawn by the needle from the spool, so as to conform to varying thicknesses of stock, by automatically adjusting or varying the strokes of the needle by the thickness of the stock, at or near the point where the needle is operating, by substantially the means described, or any equivalents thereof.

So operating the presser foot as to lift it a fixed amount from the surface of the stock, no matter what its thickness, to relieve the thread from pinch between the bed and the under surface of the stock while the thread is drawing through the stock, substantially by the means described, or any equivalents therefor.

So combining the presser foot with the needle and the parts connected therewith, substantially by the means described, or by any equivalents therefor, that the resistance offered to the upward movement of the needle rests upon the presser to prevent it from being forced upward by the upward strain upon the stock, the presser being prevented from downward motion, substantially as shown.

Combining the lever which operates the presser with a movable and adjustable fulcrum, so that more or less lift can be given the presser by the positive movement imparted by a cam or other equivalent motor.

So combining the closing slide of the needle and the needle, substantially by the means described, or any equivalents therefor, that the stroke of the slide shall be increased or diminished automatically as the stroke of the needle is increased or diminished.

So combining the closing slide of the needle with the needle, substantially by the means described, or by any equivalents thereof, that said slide is so placed as to cover the eye or hook of the needle while emerging from the stock, and to move with the neeedle, keeping its eye or hook covered till at or near the termination of the upward stroke of the needle, when the slide moves relatively to the needle, uncovering its eye, and then by moving downward with the needle, keeps its eye uncovered till the needle punctures the stock.

The arrangement of the separate instruments, the presser and feeder, directly in front of the hook of the needle, in proximity thereto, in the plane of the vibrations of the feeder, and above the stock to be sewed, so as to operate on the upper surface thereof, said plane passing through the axial line of the needle, substantially as described.

Controlling the extent of the feeding action of the feeder by making the presser adjustable, toward and from the needle in the plane of vibration of the feeder, and by constructing the presser with an inclined surface next the feeder, substantially as shown.

The combination and arrangement of the spring, 12, with the parts connected with the needle lever, so as to counterbalance the weigh of said parts, so as to retain the needle at its up stroke till the check' j2, operates on the plate. d.

36,164.—Charles Monson, of New Haven, Conn., for Improved Rotary Engine :

I claim a repeating rotary engine, constructed in manner or so as to operate substantially as described, viz., of two or more sets of curved arms, C, or their mechanical equivalents, a series of two or more tight chambers or vessels, A A1 A2, and a shaft, or its equivalent, divided into separate chambers, and provided with induction and escape passages, the whole being arranged substantially as set forth.

36,165.—A. F. W. Neynaber, of Philadelphia, Pa., for Improved Pendulum Paddles :

I claim in combination with a pair of pendulum paddles, the arrangement of the levers and links, F E I, cam, D, rod, S, and paddle, a, substantially in the manner and for the purposes herein described.

I also claim in combination with a pair of pendulum paddles, the arrangements of the shafts, levers and links, K M N P R T, chains, Q, cam, D, and bars, S, for the purpose of reversing the action of the paddles, when constructed and arranged substantially in the manner and for the purposes herein described.

36,166.—Henry Parsons, of Waterloo, N. Y., for Improvement in Harness for Looms :

I claim securing the heddle bars to, and detaching them from, the

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frame, by means of the springs, C C, pins, c c, and depressions, f f, the whole arranged, combined and operating substantially as and for the purposes herein described.

I also claim in combination with the nut, h, the spring, G, when the same are respectively connected with the heddle bars and frame, substantially as herein described.

36,167.—Martin Rae, of Manchester, England, for Improvement in Lamps. Patented in England, Sept. 16, 1861:

I claim the employment or use of a lighted lamp, taper, or other heat-producing agent at the bottom of, or into the air tube or air tubes of the lamp, arranged to operate in the manner as and for the purpose herein set forth.

[My invention consists in causing a current of air to impinge against the flame of a lamp, by means of a lamp, taper, light or other heat-producing agent, placed within or under a tube or tubes communicating with the burner, which, on being lighted or heated, causes an upward current of air, that coming in contact with the flame of the lamp, producing a white light.]

36,168.—D. C. Rand and M. Wadhams, of Perinton, N. Y., for Improved Water-Tight Cask:

I claim a close cask, rendered impervious to moisture by a coating of concentrated coal tar, substantially as and for the purposes herein set forth.

36,169.—J. L. Reid, of Van Wert, Ohio, for Improvement in Beehives:

I claim the combined moth and robber trap and ventilator, Fig. 3, constructed and applied in the manner and for the purposes specified.

I also claim the combination of the moth and robber trap and ventilator with the hive, constructed substantially as set forth.

36,170.—Anson Rowe, of Atallissa, Iowa, for Improvement in Handles for Mill Stone Picks:

I claim the adjustable key or block, B, fitted in a slot, c, in the hub or head, b, of the handle or stock, A, of a mill stone pick, substantially as and for the purpose herein set forth.

[This invention relates to an improvement in the ordinary pick handle, which consists of a piece of hard wood turned at one end, so as to be readily grasped and held by the operator, and having its opposite end comparatively large in diameter, so as to form a hub or head in which a taper hole is mortised to receive either end of the pick, which is of double taper form.]

36,171.—G. S. Rust, of Chester, Ill., for Improvement in Convertible Apple Mills, &c.:

I claim, first, The combination of the rocking beam, L, crank shaft, E, disconnectible pitman, F, shaft, H, and cylinder heads, a a, for the purpose and in the manner described.

Second, The combination of the rocking beam, L, crank shaft, E, and disconnectible pitman, F, constructed and arranged in the manner and for the purpose set forth.

36,172.—Sylvanus and A. M. Sawyer, of Fitchburg, Mass., for Improvement in Combined Time and Percussion Fuse for Explosive Shells:

We claim the combination in one fuse stock of a percussion fuse with a time fuse, substantially as described.

36,173.—J. L. Schoonmaker, of Galupville, N. Y., for Improved Washing Machine:

I claim the application of the weight, F, to the canvex rubber, D, in combination with the counterbalance weight, L, substantially and for the purpose specified.

36,174.—J. Q. A. Scott, of Pittsburgh, Pa., for Improvement in Magazine Firearms:

I claim, first, The combination of the magazine, F, containing an endless chain feeder, the longitudinally moving breech pin, D, the side passage, k, the spring, n, and the slide, k, the whole arranged and operating substantially as herein described.

Second, The employment for locking and unlocking the breech pin, D, and opening the breech of a bolt, f, lever, E, and link, e, the whole combined with the breech pin, and applied in a relation to a hole or notch, g, in the fixed portion of the breech, and operating as herein set forth.

Third, The combination with the endless chain feeder and its magazine, F, of a second cartridge magazine, L, constructed with partitions, t t, corresponding with the feeding plates of the endless chain and a sliding plate, M, or other movable partition, the whole arranged substantially as herein specified, to allow the cartridges to be transferred in a proper manner from the interior of one magazine to the endless chain of the other one, as herein set forth.

36,175.—S. J. Seely, of Brooklyn, N. Y., for Improvement in Sheet Metal Casks:

I claim, first, A cylindrically-shaped cask, the external convex surface of which is composed of sheet metal with transverse corrugations extending in a continuous series from one chime thereof to the other, when such corrugations are so constructed that the salient corrugations of one cask shall fit into the venting corrugations of that which is next it (if made of the same pattern), and so that a rank of such casks shall interlock firmly with each other and pack closely together, substantially in the manner and for the purpose above described.

Second, In a cask of a cylindrical shape, the external convex surface of which is composed of sheet metal transversely corrugated. I claim the insertion of a plain internal or lining cylinder, made to fit snug and tight to the external cylinder by which it is supported, the whole being firmly attached together at the chime, substantially as escribed.

Third, In a cask constructed of sheet metal, I claim the insertion of heads of sheet metal made sufficiently concave to prevent being bent outward by the internal pressure of the fluid which may be contained in the cask, and having flanges bent down at nearly right angles to their respective surfaces, and so shaped as to be readily fitted and riveted, or otherwise cemented to the chimes of said cask, substantially as described.

Fourth, In a cylindrical metallic cask in which the head is made slightly concave, and is constructed with a flange fitting the chime of the cask as above described. I claim making the diameter of the head proper larger than the internal diameter of the cask, in combination with a groove or corrugation fitted to receive it, so that when such head is sprung into the cask it shall find a firm shoulder, and make a closer joint when any internal pressure is brought against the head, as is herein before described.

Fifth, In a cylindrical corrugated cask, constructed as herein before described, in which the bung hole is placed upon the convex side thereof, I claim surrounding it with metallic supports, composed of two parts attached together and fitting the corrugations of the body of the cask, substantially as above described.

Sixth, In a metallic cylindrical cask having the bung hole upon its convex cylindrical surface, and so constructed as to be nearly flush with that surface, I claim so connecting the bung that it will be somewhat depressed beneath the cheeks which surround the hole, so as to be protected by those cheeks when the cask is rolled over an even surface, substantially as described.

36,176.—E. L. Seymour (assignor to L. F. Therasson and Hiram Ketchum, Jr.), of New York City, for Improved Mode of Lifting and Bagging Grain:

I claim the combination of two, three, four or more inclined sifting surfaces of increasing graduated length, with respective solid prolongations and delivery troughs arranged one above the other, so that the coarsest sieve shall be at the top, and the finest at the bottom, as described and for the purposes described.

36,177.—J. C. Stanley, of Lawrence, Mass., for Improvement in the Bobbins of Throstles for Spinning Machines:

I claim my improved arrangement of the friction washer, d, or the same and its disk, e, relatively to the bobbin head, b, viz., so as to extend up into and be capable of operating therewith, substantially in the manner and for the purpose as described.

36,178.—Thomas Stibbs, of Wooster, Ohio, for Improvement in Looms:

I claim, first, The arrangement of the bands, a b, and pulleys, I J K L, in combination with each other and with the heddle frames of the loom, substantially as and for the purpose herein specified.

Second, The arrangement of the cam shaft, E, cams, D D′ D3, and levers, M M′ M2, in combination with the bands, d b, and pulleys, I J K L, substantially as herein specified.

Third, The arrangement of the band, t, lever, N, and cam, C, for working the rock shafts and rollers which carry the selvedge heddles, substantially as herein specified.

[This invention consists in a certain novel arrangement of bands, pulleys, levers and cams, in combination with the heddle frames, whereby the operation of the harness, for plain or fancy weaving, is rendered very easy and free from any jarring motion, and great facility is afforded for its adjustment, whenever that is necessary.]

36,179.—G. W. Thompson and A. H. Rogers, of Marion, Iowa, for Improved Sugar-Juice Evaporator:

First, We claim the revolving skinner, B, or its equivalent, in combination with the bail, C, to be operated in the manner and for the purpose herein set forth and described.

Second, We claim the two chimneys with accompanying dampers, in combination with damper in the furnace, as herein specified.

36,180.—E. S. Tichenor, of Jacksonville, N. Y., for Improvement in Cultivators:

I claim the combination of the springs, c c, or their equivalents, with the hinged tooth of a cultivator, substantially as above described for the purpose set forth.

36,181.—G. N. Trowbridge, of Rollinsford, N. H., for Improvement in Shaft Coupling:

I claim my improved shaft screw coupling, having the male screw of one shaft equal in length to and that of the other, of a less length than the female screw of the coupling nut.

I also claim my improved shaft coupling, as constructed with the chamber or shaft recess, d, and in other respects substantially as described.

36,182.—W. P. Trowbridge, of New York City, for Improvement in Sounding Instruments:

I claim, first, The combination of the rising and falling propeiler, B, and registering mechanism, with the frame work, A, substantially in the manner and for the purpose described.

Second, The arrangement of the fixed stop, t′, in combination with the swinging arm, l, wheel j, and index, r, as and for the purpose specified.

36,183.—A. C. Twining, of New Haven, Conn., for Improvement in Condensers for Steam Engines:

What I claim is, first, The combination or use in a steam engine, of an exhaust pipe or steam chest, and a cold water pipe or water chest, with a condenser, arranged with suitable orifices or pipes, one or more, between the condenser and the chests or pipes first named, to conduct the exhaust steam and condensing water separately, but in close proximity, into the condenser, substantially as and for the purpose described.

Second, The employment of a rotating apparatus, in combination with the condenser, to deliver the water and air, and to be rotated wholly or in part by the rush of the water of condensation; or by a pulley wheel and band, substantially as shown and described.

36,184.—Christian Wahl, of Chicago, Ill., for Improvement in Extracting Oil from Pigs' Feet:

What I claim is the process for treating pigs' feet, for the extraction of their contained oil and gelatinous matter.

36,185.—Henry Walter, Sr., of Elizabeth City, N. J., for Improvement in Machine for Preparing Tobacco:

What I claim is, first, The employment or use, in preparing tobacco leaves, of rollers, A A, or their equivalents, arranged substantially as and for the purpose described.

Second, The combination of the adjustable scrapers, M, with the rollers, A A, as and for the purpose specified.

36,186.—Henry Wilde, of Newark, N. J., for Improved Chamfering and Crozing Machine:

What I claim is the inclined curves, the inclosed gearing and revolving cutters, when constructed, arranged and combined, substantially in the manner and for the purpose herein above set forth.

36,187.—Emerson Wood, of Monson, Mass., for Improved Carpet Stretcher:

What I claim is the bar, F, fitted in the frame, A, and provided with the adjustable toothed or sparred arms, G G, arranged substantially as shown, and operated through the medium of the rack, E, and toothed segment, D, in combination with the manner of adjusting the toothed or spurred arms, G G, to wit: by connecting them to the slide or collar, H, on the bar, F, by rods, I I, and securing the slide or collar on the bar by a pin, a*, as described.

[The object of this invention is to obtain a simple and efficient device for stretching carpets, preparatory to tacking or securing them to the floor; one that may be operated with the greatest facility, and still be capable of stretching perfectly heavy carpets, such as Brussels, Three Ply, Wilton, &c., which cannot be stretched evenly and smoothly by the ordinary hand implements hitherto used.]

36,188.—E. T. Woodward, of Charlestown, Mass., for Improved Can for Oils, Varnishes, &c.:

What I claim as a new article of manufacture is the above-described can, A, and box, B, combined, the box being cut away for the passage of the neck, a, of the can, substantially as described.

36,189.—L. J. Adams, of Cleveland, Ohio, assignor to himself and C. L. Petter, of Rochester, Ohio, for Improvement in Water Elevators:

What I claim is, first, The counter-balance pawl, F, and ratchet wheel, E, in combination with the elongated opening in the box, G, operating as and for the purpose specified.

Second, I claim the elongated opening in the box, G, in combination with the lever, H, and packing, H′, operating as and for the purpose specified.

36,190.—James Clements (assignor to himself and Sedgwick Dean), of Ann Arbor, Mich., for Improved Can for Fluids:

I claim, as an improved article of manufacture, a covered or close can, provided with, or having inserted in its side, one or more plates of glass or other transparent material, substantially as and for the purpose set forth.

[This invention consists in providing a covered or close can with one or more openings, in which glass or other transparent material is placed, in order to show the quantity of the fluid substance within the can, and also the kind or quality thereof. The invention is designed to obviate the trouble of tilting or shaking the can, in order to ascertain how much fluid there is within it, and also to avoid pouring any of it out, in order to ascertain what kind of fluid it is.]

36,191.—O. G. Critchett (assignor to himself and C. C. Dike), of Stoneham, Mass., for Improvement in Eyelet Machines:

I claim, as my invention, a combination consisting of the mechanism for holding eyelets, and feeding them successively forward upon an anvil or its equivalent, and the mechanism for retaining each eyelet on the anvil and separating it from its feeding mechanism, and subsequently compressing it and setting it into an article when placed on such anvil, the whole being substantially as herein before described.

I also claim the combination of the eyelet magazine, D, a separator, F, and a carrier, G, arranged and made to operate together, substantially in manner and under circumstances as described.

I also claim the combination of the eyelet and work receiver or pin, a, with the anvil, B, and the eyelet feeding and setting machinery.

I also claim the combination and arrangement of the eyelet guide rod, E, with the eyelet magazine.

36,192.—Antonio Meucci, of Clifton, N. Y., assignor to Antonio Jané, of Brooklyn, N. Y., for Improvement in Kerosene Lamps:

What I claim is the combination of a plate of platinum (or other metal having the same qualities), with the wick tube of a lamp, substantially as set forth, the said plate being adjustable vertically.

36,193.—A. B. Nimbs, of Buffalo, N. Y., assignor to himself and J. C. Clifford, for Improvement in Floating Grain Elevators:

I claim, first, Supporting and operating the elevator leg upon a turn table, for the purposes and substantially as set forth.

Second, Placing and using the discharging spout of the elevating leg in line with the center of the turntable, so that any movement of the turntable and elevating leg, will not change the relative position of the spout.

Third, The combination of a grain-elevating apparatus and bin, with a vessel, the elevating leg and bin being so placed and arranged that the bin shall be above the deck of the vessel, and sufficiently high so that the grain may be discharged from the bin (or from the bin through the weighing scales) into a boat alongside, substantially as described.

Fourth, Supporting the weighing scales upon a suspended platform, so that the scales and hopper will at all times maintain a perpendicular position, notwithstanding the listing of the vessel.

Fifth, The combination of a railroad track with a vessel and elevating apparatus, for the purposes and substantialy as set forth.

36,194.—R. H. Peck (assignor to himself, E. M. Gifford and Orrill Whitney), of Wolcott, Vt., for Improvement in Vegetable Cutters:

What I claim is the use of transverse cutters, J, mounted upon the adjustable part, G, and adjusted by the screw, H, or its equivalent, in combination with the revolving wheel, B, and the hopper, A, substantially as herein shown and described.

36,195.—William Peters (assignor to himself and Alfred Buck), of Baltimore, Md., for Improvement in the Manufacture of Fire Brick:

What I claim is making fire brick of asbestos and other material, substantially as herein set forth.

36,196.—Elliot Savage (assignor to Charles Parker), of Meriden, Conn., for Improvement in Machine for Threading Wood Screws:

I claim, first, So mounting the rotating cutter in its relation to the screw blank, that the said cutter may have a positive rotary motion given to it, the speed of which shall be so varied automatically that whether cutting in a fixed spot or moving along the blank, the velocity of rotation of said cutter shall be such as to cause its cutting edges always to correspond with the spiral threads as they are being formed upon the blank, irrespective of the speed with which said cutter is moved bodily along toward the point of the blank, substantially in the manner set forth.

I claim, second, The construction and arrangement of mechanism, as herein before described, for imparting rotary motion to the cutter.

I claim, third, Connecting the cam, M, with the driving shaft, g, by an arrangement of mechanism capable of being so adjusted as to produce a change in the speed of the cam, and in the extent of travel of the carriage, without changing the speed of the shafts, g or h, substantially as set forth.

36,197.—Ira W. Shaler, of Brooklyn, N. Y., and Reuben Shaler, of Madison, Conn., assignors to Ira W. Shaler, aforesaid, for Improvement in Compound Bullet for Small Arms:

I claim the projectile hereinbefore described, made up of two or more parts, each of equal diameter, constructed as set forth, so as to separate from each other as stated.

36,198.—E. G. Tobey (assignor to himself and Josephus Nash), of Portland, Maine., for Improvement in Kerosene Lantern:

What I claim is, first, The combination of the fastenings, c c, the flanch, a, and the cap, C, substantially in the manner and for the purpose described.

Second, The cap, C, constructed and operating substantially in the manner and for the purposes herein described.

Third, The combination of lantern, A, burner or lamp, B, and cap, C, substantially as described.

36,199.—J. G. Wilson (assignor to C. P. Dixen and Edward Learned), of New York City, for Improvement in Knitting Machines:

What I claim is, first, The employment of a pad or pads of india rubber or other yielding material, applied and operating in combination with the needle ring or needle bar and needles, substantially as and for either or both the purposes herein specified.

Second, Giving the pad, M, a compound motion, substantially as herein described, whereby it is caused first to press and to hold the work, while the needles are completing their descent into the needle ring, and afterward to give a second pressure, or draw the loops over the heads or bends of the hooks of the needles, during the ascending movement of the latter, substantially as herein described.

Third, The stop motion, composed of slides, l l, suspended from the yarns, and a notched reciprocating bar, P, or its equivalent, applied in combination with an organized knitting machine, to operate substantially as herein specified.

36,200.—W. L. Woods, of Washington City, D. C., assignor to Harriet Woods, of Centreville, Ind., for Improvement in Paper File:

What I claim is a combination of two boxes, one within the other, and attached, forming a folding box with two lids, and a tablet attached, producing a practical file and safe for business papers, as heredescribed.

RE-ISSUE.

1,327.—G. P. Cox, of Malden, Mass., Administrator of S. A. Cox, deceased, and Assignee by mesne assignments of said decedent. Letters Patent No. 479, dated Aug. 8, 1849. Re-issued July 14, 1857, for Improvement in Machine for Bending the Lip of Wrought-Iron Railroad Chairs:

I claim, first, A suitable support for a chair blank, in combination with bending levers, or a bending apparatus and a former, or their equivalents, acting in combination, substantially as specified herein-before.

Second, a drop hammer, or its equivalent, for the purpose set forth, in combination with the bending levers, a former, and a suitable support for the chair blank, or their equivalents, for the purposes set forth, and acting in combination, substantially in the manner herein-before set forth.

Third, The use of the discharging lever, K, or equivalent therefore, in combination with the former, for the purpose of forcing said former from the chair.

DESIGNS.

1,624.—S. D. Arnold (assignor to P. & F. Corbin), of New Britain, Conn., for Design for Lifting Handle Plate for Coffins, &c.

1,625.—J. W. Burt, of New York City, for Design for Ornamental Anklet.

1,626.—T. W. Evans, of Philadelphia, Pa., for Design for a Trade Mark.

1,627.—John Gault, of Boston, Mass., for Design for Postage Stamp case.

1,628.—Constant Hesdra, of Brooklyn, N. Y., assignor to W. H. Core and A. Lorenz, of New York City, for Design for the Base of a Show Case.

1,629.—H. G. Tyer, of Andover, Mass., for Design for Trade Mark.

1,630 to 1,649.—E. J. Ney, of Lowell, Mass., assignor to The Lowell Manufacturing Company, for twenty Designs for Carpet Patterns:

THE success in cultivating cotton and tobacco in southern Illinois, this season, equals anticipation. The cotton fields look well, and some persons estimate the crop will yield as high as 25,000 bales. It would have been much larger than that even could seed have been procured at the planting season. The cotton lands of southern Illinois are not much behind those of Mississippi or Tennessee, and should the crop turn out well this fall, it is thought the crop of 1862 may come up to 100,000 bales.

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PATENTS FOR SEVENTEEN YEARS.

The new Patent Laws enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from **$30** down to **$15**. Other changes the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, excepting reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co., No. 37 Park-row, New York.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office No. 37 Park-row, New York, or either of our Branch Offices.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief story of the case, inclosing the official letters, &c.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

Notes and Queries

G. W., of Mass.—You can purchase several works in Springfield, in which you may obtain the information desired on photography, the stereoscope, and the use of instruments.

J. W., of Ohio.—Your article on hanging stones and milling in general has been received, but the information contained in it being so similar to that which has already appeared on the subject in our columns, will preclude its publication

M. W., of N. Y.—The largest gun in the world is said to be an old piece at Constantinople, which has a bore of 22 inches in diameter. The greatest distance to which a projectile has been thrown, so far as we know, is about 5½ miles with one of Whitworth's guns.

W. W. L., of Pa.—It would require a minute examination of the geological formation of your district to form an opinion in regard to the probability of finding water by sinking an artesian well. If there is a stratum of rock or clay which slopes downward from the mountain under the surface at your place, so that it carries the water down and holds it there, then by boring through this stratum you will allow the water to rise to the surface. Sometimes these inclined strata carry the water many miles.

F. K., of Cal.—By remitting $2 either in gold or postage stamps we will send you the paper for one year. Your inquiry concerning the separation of gold from sulphurets is an important one. We should think that roasting the quartz would be the most rapid mode of expelling the sulphur, but as this would be expensive, we suppose the best plan yet known is to spread the tailings on the ground and expose them for a few weeks or months to the weather, and then run them through the amalgamator again ; repeating the process as long as it pays.

F. W. B., of Mass.—If the slide valve of an engine fits absolutely steam-tight, the pressure acting to hold it to its seat will be in proportion to its whole area, as it will act on every part but that which at any time covers the partly-open port through which the induction of steam is taking place, and which has its force exposed to the steam.

P. E. C., of Va.—Emery cloth is now made. Your device for cleaning gun barrels is new to us, and we think patentable. It is common to inclose memorandum books within portmonaie cases. Francis & Loutrell, New York, manufacture diaries, and J. T. Moore & Co., emery paper.

R. T., of 88 Pa. Vol., Va.—We think the best varnish which can be used for browned gun barrels is a little bees' wax dissolved in turpentine, and if turpentine cannot be obtained use bees' wax and oil. Put on a very thin coat and allow it to dry.

A. S., of N. Y.—A 6-inch pipe under two feet head will discharge 15 cubic feet of water per second, which will weigh 937 pounds, and this weight falling 20 feet gives 34-horse power. No overshot wheel has yielded so large a proportion of the whole power as the best turbines, but turbines are adapted to those works only in which the resistance does not vary much.

H. B. H., of Cal.—There is no agreement between the English and American Governments to give a year's notice before commencing hostilities. It might be a good arrangement to require a hundred years' notice.

A. R., of Va.—You can dissolve india rubber in naphtha, and when it becomes dry it will possess the same qualities as before it was dissolved. You can make plastic india rubber hard by mixing it with lampblack, black lead, and some sulphur, then baking it in an oven heated to about 300°. But this is a patented process and cannot be used without the consent of the assignees of Goodyear's patent.

C. K., of Pa.—Chlorine gas forced into a vessel containing dissolved shell-lac will bleach it, but it also changes its properties The most safe and simple method of bleaching it is by exposure in fine shreds to the rays of the sun.

M. H. G., of N.Y.—To make an amalgam of copper triturate grain or finely subdivided copper in an iron mortar with mercury. Quicksilver seems to form the most fluid amalgam with lead. A small proportion of mercury in gold renders the latter very brittle.

H. B., of Ind.—Many coffins made in this city are covered with fine black cloth ; but we have seen none covered with any substance that was an exact imitation of cloth.

V. V., of N. Y.—London is situated in a chalk basin, and the whole coast of England opposite France is formed of chalk cliffs.

H. V. R., of Pa.—The British Government has been as oftentimes swindled as any other under the sun. In 1824, a Dr. J. C. Smith received from Parliament $25,000 for a receipt for typhus fever, which consisted in pouring oil of vitriol among powdered saltpeter in a tea cup, placed in the room of a sick person. It is also asserted in English journals of the present day, that the British Government is now being swindled by the contract made with Sir William Armstrong to make his guns.

T. T. I., of Conn.—A very hard mastic cement may be made with 100 parts dry sand and 10 parts red lead mixed with oil. Another good mastic cement is made with 100 parts sand, 50 of chalk, 4 of white, 3 of red lead and 3 of ocher. In appearance it resembles London yellow mastic.

H. W., of Mass.—Carmine ink is made with cochineal carmine paint dissolved in aqua ammonia. A piece of carmine the size of a small pea will make a common ink bottle full of beautiful red fluid.

R. W. B., of Vt.—The raising of water by the alternate force of steam, and the vacuum produced by condensed steam was effected by Savery before the modern steam engine was invented. You will find his mode illustrated on page 52, Vol. IV. (new series) SCIENTIFIC AMERICAN.

T. R., of Ohio.—Pure black lead is carbon in a peculiar condition, and not a mixture of lead and iron as you have supposed.

Money Received

At the Scientific American Office on account of Patent Office business, from Wednesday, Aug. 13, to Wednesday, Aug. 20. Persons having remitted money to this office will please to examine this list to see that their initials appear in it, and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, and inform us the amount, and how it was sent, whether by mail or express.

T. H., of Cal., $20; B. R., of N. Y., $45; R. S., of N. Y., $45; C. M. B., of Mass., $20; C. G. P., of Ind., $45; W. G., of Mass., $45; H. B., of Pa., $20; R. & D., of Pa., $20; A. O. C., of N. J., $20; A. S. L., of N. Y., $20; M. R., of Mo., $20; S. R. S., of Ohio, $43; A. I., of Pa., $20; S. & C., of Mass., $20; J. S. H., of N. Y., $15; P. M., of France, $40; J. N., of N. Y., $20; A. T. P., of N. Y., $20; H. J. S., of N. Y., $30; S. E. C., of Mass., $15; A. B., of Conn., $150; C. F. B., of R. I., $20; P. A. S., of N. Y., $20; J. F. T., of Mass., $20; R. R., of N. Y., $40; H. V. F., of Ind., $20; J. W. S., of N. Y., $20; B & V. D., of N. Y., $20; W. E. S., of Mass., $20; J. M. H., of Pa., $20; S. E. C., of Mass., $15; A. & M., of Wis., $20; A. S., of Kansas, $15; T. F. R., of N. Y., $60; P. & R., of England, $50; C. E. S., of Wis., $60; P. D. W., of R. I., $25; K. & R., of Ill., $25; A. L. & Co., of N. Y., $10; J. M. P., of Ill., $20; W. T. M., of Cal., $15; J. W., of Iowa, $25; G. A. P., of N. Y., $25; T. D. L., of N. H., $25; J. A., of Pa., $15; J. K., of N. J., $15; P. M., of Ind., $25; H. G., of Mass., $30; T. H. K., of Vt., $15; L. M. S., of Ill., $25; W. B., of Mass., $20; J. R. A., of Pa., $50; H. K., of N. Y., $15; J. A. O., of N. Y., $15; E. P., of Ill., $100; L. D. B., of N. J., $15; J. W. G., of Mass., $15; O R. B., of N. Y., $25; J. P., of N. Y., $25.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from August 13 to Wednesday, August 20, 1862:—

C. S. D., of N. Y.; J. M. P., of Ill.; P. D. W., of R. I.; K. & R., of Ill.; A. J. & C. L., of N. Y.; C. W. S., Iowa (2 cases); J. W. of Iowa; G. A. P., of N. Y.; T. D. L., of N. H.; P. L., of Ohio; G. T. L., of Pa.; P. M., of Ind.; D. W. W., of N. Y.; W. B., of Mass.; H. G., of Mass.; G. B. R., of Ill.; O. R. B., of N. Y.; L. M. S., of Ill.; H. & R., of N. Y.; H. C., of Pa.

TO OUR READERS.

RECEIPTS.—When money is paid at the office for subscriptions, a receipt for it will always be given ; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona fide* acknowledgment of our reception of their funds.

INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on design patents when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application at this office. Address MUNN & CO.,
No. 37 Park-row, New York.

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We are prepared to bind volumes in handsome covers, with illuminated sides, and to furnish covers for other binders. Price for binding, 50 cents. Price for covers, by mail, 50 cents; by express, or delivered at the office, 40 cents

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INVENTORS AND CONSTRUCTORS OF NEW AND useful Contrivances or Machines, of whatever kind, can have their Inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN on payment of a reasonable charge for the engraving.

No charge is made for the publication, and the cuts are furnished to the party for whom they are executed as soon as they have been used. We wish it understood, however, that no secondhand or poor engravings, such as patentees often get executed by inexperienced artists for printing circulars and handbills from, can be admitted into these pages. We also reserve the right to accept or reject such subjects as are presented for publication. And it is not our desire to receive orders for engraving and publishing any but good Inventions or Machines, and such as do not meet our approbation in this respect, we shall decline to publish.

For further particulars, address—

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RENSSELAER POLYTECHNIC INSTITUTE, TROY, N. Y.—The thirty-ninth Annual Session of this Institution for instruction in the Mathematical, Physical and Natural Sciences, will commence on Wednesday, Sept. 17, 1862. Appropriate quarters, and a full supply of apparatus, will be provided, so that all the Courses of Instruction can be given precisely as heretofore. The new buildings for the Institute will be placed on a more commanding site, and be constructed as soon as possible.

The Annual Register, containing full information, can be obtained from Prof. CHARLES DROWNE, Director. 6 6

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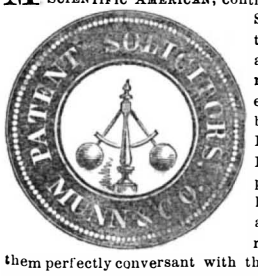

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A pamphlet of information concerning the proper course to be pursued in obtaining Patents through their Agency, the requirements of the Patent Office, &c., may be had gratis upon application at the Principal Office, or either of the Branches. They also furnish a Circular of information about Foreign Patents.

The annexed letters from former Commissioners of Patents we commend to the perusal of all persons interested in obtaining Patents:—

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Immediately after the appointment of Mr. Holt to the office of Postmaster General of the United States, he addressed to us the subjoined very grateful testimonial:—

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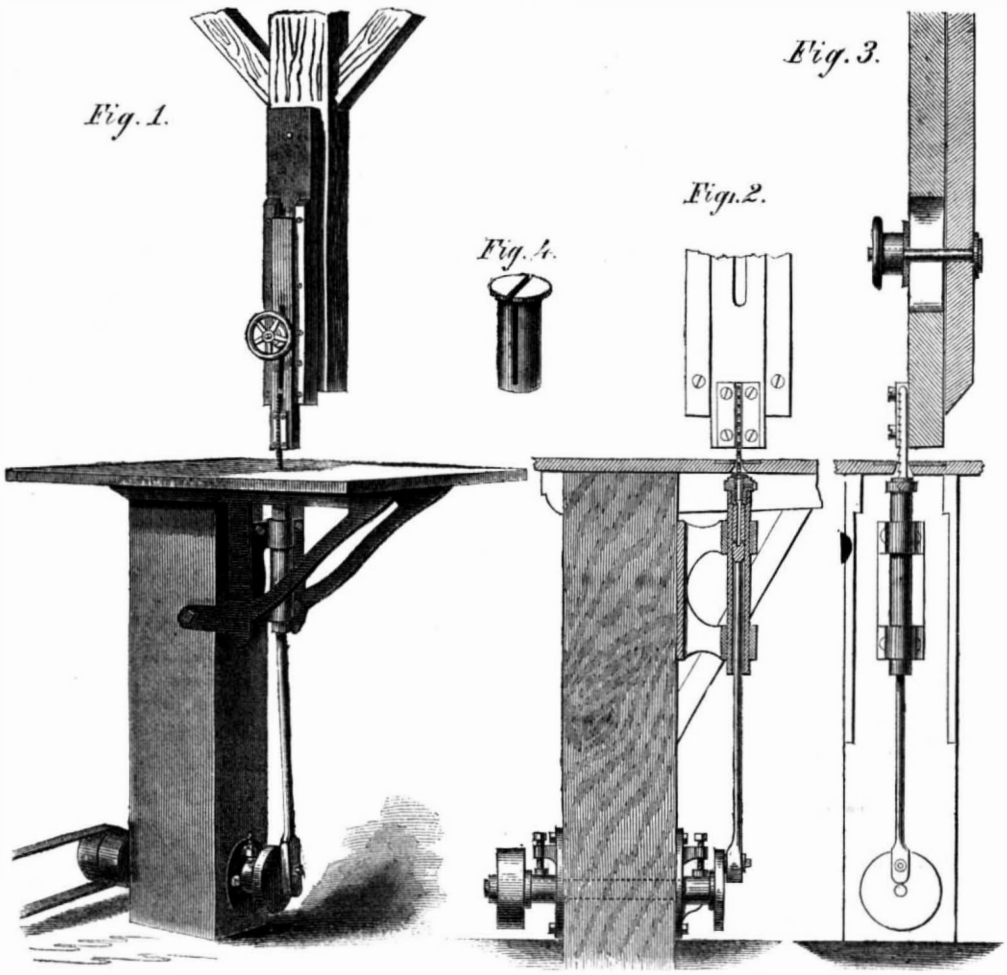
Improved Scroll Saw.

We here illustrate some improvements in the scroll saw, invented by John Richards, of Columbus, Ohio, the object of which is to reduce the weight of the reciprocating parts and thus permit a high speed to the saw. A further purpose of the improvements is to so simplify the whole mill that it may be constructed at small cost, and may be easily kept in repair.



RICHARDS'S SCROLL SAW.

To obtain the greatest possible lightness in the reciprocating parts, the frame for straining the saw is dispensed with, and the saw is fastened to the pitman with its upper end running between two guide plates, which are secured to a pendent bar overhead; the hight of this bar being adjustable so that the guide plates may always be brought in close proximity to the upper surface of the stuff which is being sawed.

Fig. 1 of the engravings is a perspective view of the mill, and Fig. 2 and 3 vertical sections at right angles with each other.

The upper portion of the pitman, D, is a hollow cylinder, E, having a vertical reciprocating motion in the guide arms, *d* and *d*, of the bracket, C. The bore of the cylinder, E, is larger than the rod, D, of the pitman in order to allow the lower end of the latter to oscillate as it is driven by the crank pin on the wheel, *c*. The lower end of the saw, E, is secured in the upper end of the cylinder, E, by inserting it in the slot in the pin, *e*, and then turning the screw, *g*, against the side of this pin so as to forcibly clamp the saw in its place. The pin, *e*, is represented on a larger scale in Fig. 4. It is secured by the screw, *g*, in a short cylinder, *f*, which is fastened to the upper end of the pitman rod, D, by means of the long screw, *i*. This arrangement obtains an effectual guide for the saw with a moderate length of pitman.

The upper end of the saw runs between the two guide plates, *n*, which are secured to one side of the slide, J, at its lower end. This slide is fitted to a groove in the pendent timber, J, and is held in place by a bolt, K, and nut, *k*, this bolt passing through a round hole in the timber and through an elongated slot in the slide, J, so that the hight of this slide may be adjusted to the thickness of the stuff which is being sawed. The guide plates, *n*, are made of hardened steel and a steel plate sustains the back of the saw. The width apart of these plates is made adjustable so as to fit saws of any thickness, and as no holes in the blade are required any saw may be fitted in this mill in a moment.

The crank wheel, *c*, has its shaft, B, passing through a simple post, A, which may be secured firmly in the ground thus forming an exceedingly simple machine.

The several improvements embraced in these combinations are secured by three letters patent all bearing date May 27, 1862, and further information in relation to them may be obtained by addressing Spencer & Richards, at Columbus, Ohio.

American Improvements in Tanning.

The following is from a contributor to the *Shoe and Leather Reporter*:—

Among all the improvements of the age the American tanners have kept up with the times. There are many names to be remembered in this connection. Toby, of Hudson, made the first bark mill, and it has been little improved since his time. To Perego and his partner, we owe the improved apparatus now used to draw the liquor from the bottom of the vats. The original heater for leaching bark was first used by a Quaker tanner near Poughkeepsie, and it was afterward improved and patented by another. The invention of the roller was always claimed by Jeremiah Guyle, also by Deacon Munson, though patented by Col. Edwards.

At the commencement of the present century, few establishments had adopted either steam or water power, but now in this State alone we have 125 tanneries supplied with steam engines and 418 which use water-power.

In the year 1826, by a more judicious use and a more scientific gradation of the tanning liquors, and by omitting to skive, we began to make a greater proportionate weight of leather; a change productive of many advantages, not the least of which was that it left money in the bank. In my early days, 16, 20 and 30 per cent was called a good gain of weight. Now 50 to 80 per cent is none too much.

I well remember an old tanner who, passing his journeyman as he was hard at work skiving down the butts and necks of the hides on the beam, patted him on the shoulder, and said:—"Young man, I had rather pay you to leave that on." Neither tanner nor journeyman have lost anything by that lesson.

A Whistling Oil Well.

A novel incident, says the Philadelphia *Ledger*, occurred on the Widow McClintock's Farm Oil Creek, recently. That portion of the tubing of the Van Slyke well which runs into the receiving tanks from the well, was removed, in order to make some repairs, leaving the conductor pipe still in the well. Next morning the inhabitants of that region were startled by the sound of a gigantic steam whistle, and found that it proceeded from this well. The gas forcing up through the pipe, had probably met with some obstruction, which caused it to perform in this way. The scream of this whistle was tremendous, and could be heard several miles.

THE British ship *Theodore Kωp*, lately sailed from New Orleans for Liverpool, with 1,296 bales of cotton, the first cargo to Europe since the port was reopened.

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To the Inventor!

The SCIENTIFIC AMERICAN is indispensable to every inventor, as it not only contains illustrated descriptions of nearly all the best inventions as they come, but each number contains an Official List of the Claims of all the Patents issued from the United States Patent Office during the week previous; thus giving a correct history of the progress of inventions in this country. We are also receiving, every week, the best scientific journals of Great Britain, France and Germany; thus placing in our possession all that is transpiring in mechanical science and art in these old countries. We shall continue to transfer to our columns copious extracts from these journals of whatever we may deem of interest to our readers.

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FROM THE STEAM PRESS OF JOHN A. GRAY

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